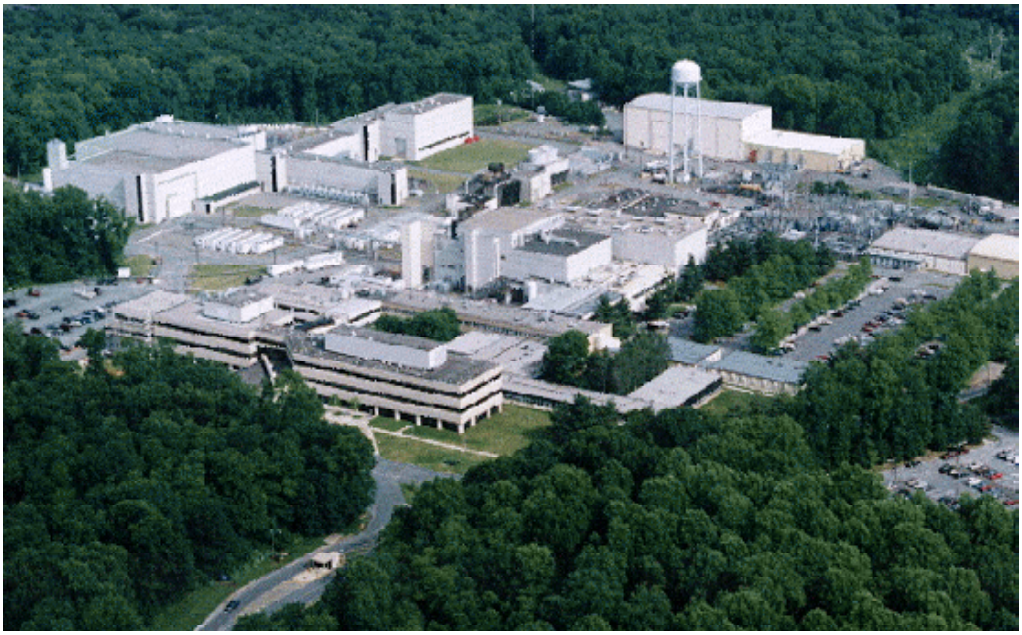
Ten-Year Site Plan

May 2005



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I. Executive Summary

This Ten-Year Site Plan (TYSP) is a comprehensive plan addressing how PPPL's real property assets will support the Department of Energy Strategic Plan, and the DOE Office of Science report "Facilities for the Future: A Twenty-Year Outlook". The Plan is developed in accordance with the Real Property Asset Management (RPAM) Order, DOE 0 430.1B and DOE-SC guidance. The Plan is consistent with the Integrated Facilities and Infrastructure (IFI) crosscut budget and the annual budget submission. The Plan integrates functional components of land use, facilities and infrastructure acquisition, maintenance, recapitalization, safety and security, and disposition plans into a comprehensive site-wide management plan. The Plan includes assessment of past performance and projected futures outcomes; and strengthens communication and accountability among projects, infrastructure support and technical infrastructure.

This TYSP covers the FY 2007 through FY 2016 time period. In addition, data for FY 2005 and 2006 is included. This TYSP covers all DOE facilities at the Princeton Plasma Physics Laboratory (PPPL), which is comprised of "C-Site" and "D-Site". The TYSP describes the existing site and infrastructure of the Princeton Plasma Physics Laboratory (PPPL) in terms of how it supports current programs and what is needed to support programs planned for the future.

In support of the PPPL mission and U.S. ITER activities, important maintenance improvements are planned to buildings, shops, storage areas and offices. U.S. ITER activities are likely to result in slight increases in scientific staff at the PPPL and plans to provide appropriate office space are underway. The buildings, shops, storage areas and offices in proximity to the NCSX Test Cell are beginning improvements to support the project's construction and operation. Several GPP projects are planned for the next three years to ready these facilities for NCSX.

What is needed and planned over the next five years includes modernization, repairs and upgrades throughout PPPL facilities. Significant funding is necessary to accomplish these projects. Should budgets be limited over the next several years, the minimal infrastructure goal will be to keep up with repairs and critical maintenance for the existing facilities. The DOE-SC and PPPL goal of reducing deferred maintenance will be accomplished by increasing maintenance funding as a function of Replacement Plant Value (RPV) and making efficient use of anticipated increases in "Deferred Maintenance Reduction" funding to be provided by DOE-SC.

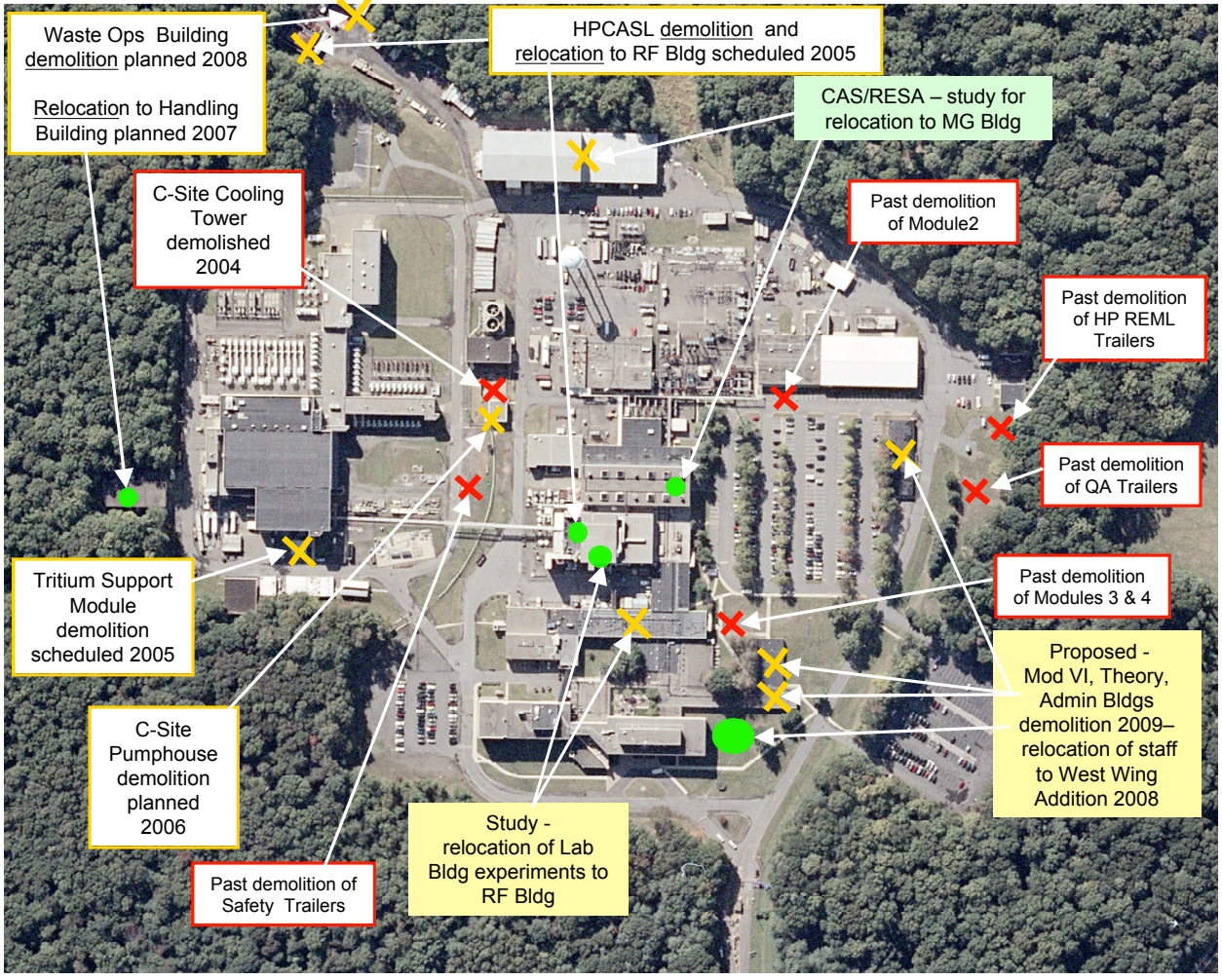
Changes are needed in order to meet our infrastructure goals and maintain a vibrant facility. A major issue over the next five years is the need for restoration of significant Science Laboratory Infrastructure (SLI) funding and other sources of funding. Modernization, reducing maintenance backlogs and keeping up with repairs of aging facilities cannot be accomplished with flat GPP funding. The possibility of decreasing programmatic funding would make it more difficult to reach the goal of expending 2% of RPV for maintenance costs.

PPPL is implementing cost reductions and efficiencies and others are planned and are being focused on. These efforts need to be combined with the restoration of Science Laboratory Infrastructure (SLI) funding or alternative sources of funding for PPPL to fully meet

infrastructure goals. Increases in energy (electric/gas) costs merit re-visiting energy efficiency studies in an effort to reduce Laboratory overhead expenses and attain cost reductions.

Over recent years, the Laboratory has realized efficiency gains by consolidating staff and functions and disposing of older outlying buildings. This trend has enabled a reduction in expenditures and we will continue to pursue this strategy. A key project that can result in major efficiency gains is construction of the LSB West Wing Addition office building, which is proposed in this Plan as a Line Item funded project. Construction of the LSB West Wing Addition would allow consolidation of several buildings and result in maintenance and energy savings.

Improving Efficiency by Reducing our Footprint



A decrease in DOE programmatic funds (or without adequate GPP, SLI or Deferred Maintenance Reduction funds) will require PPPL to aggressively remove buildings from service. Available SLI funds or existing funds would be used to drastically consolidate personnel, labs, and shops. The priority focus would be on infrastructure safety at the expense of capability. Maintaining a dynamic infrastructure requires a flexible plan that can respond to changing needs -- we

anticipate that additional capital projects may crop up causing the forecast of needs beyond 2 to 3 years to change. We will review the budgets allocated by DOE and make prudent stewardship decisions based on carefully balancing priorities between safety, stewardship, and mission accomplishment. The Infrastructure goal will be to keep up with repairs and critical maintenance for the existing facilities.

II. Site Summary

The U.S. Department of Energy's Princeton Plasma Physics Laboratory (PPPL) is a Collaborative National Center for plasma and fusion science. Its primary mission is to develop scientific understanding and key innovations leading to an attractive fusion energy source. Associated missions include conducting world-class research along the broad frontier of plasma science and technology, and providing the highest quality of scientific education.

The Princeton Plasma Physics Laboratory has engaged in fusion energy research since 1951. The reaction occurring in our sun as well as in other stars is fusion. In a fusion reaction, the nuclei of hydrogen atoms, in a plasma state, fuse or join to form helium atoms, causing a release of neutrons and energy. Unlike the sun, PPPL's fusion reactions are magnetically confined within a vessel or reactor under vacuum conditions. The long-range goal of the U.S. Magnetic Fusion Energy Research Program is to develop and demonstrate the practical application of fusion power as a safe, alternative energy source. In the early 1950's, Dr. Lyman Spitzer's vision for plasma physics culminated in Project Matterhorn, which gained approval of the U.S. Atomic Energy Commission. Its mission was to contain and harness the nuclear burning of hydrogen at temperatures exceeding those found in the sun. Named for, Dr. Spitzer's A, B and C stellarators, PPPL was first located on A- and B-sites of the James Forrestal Campus; and in 1959, PPPL moved to its present location at C-site. In the late 1970's, D-site became the home of the Tokamak Fusion Test Reactor (TFTR), which has been dismantled, and is now the home of the National Spherical Torus Experiment (NSTX).

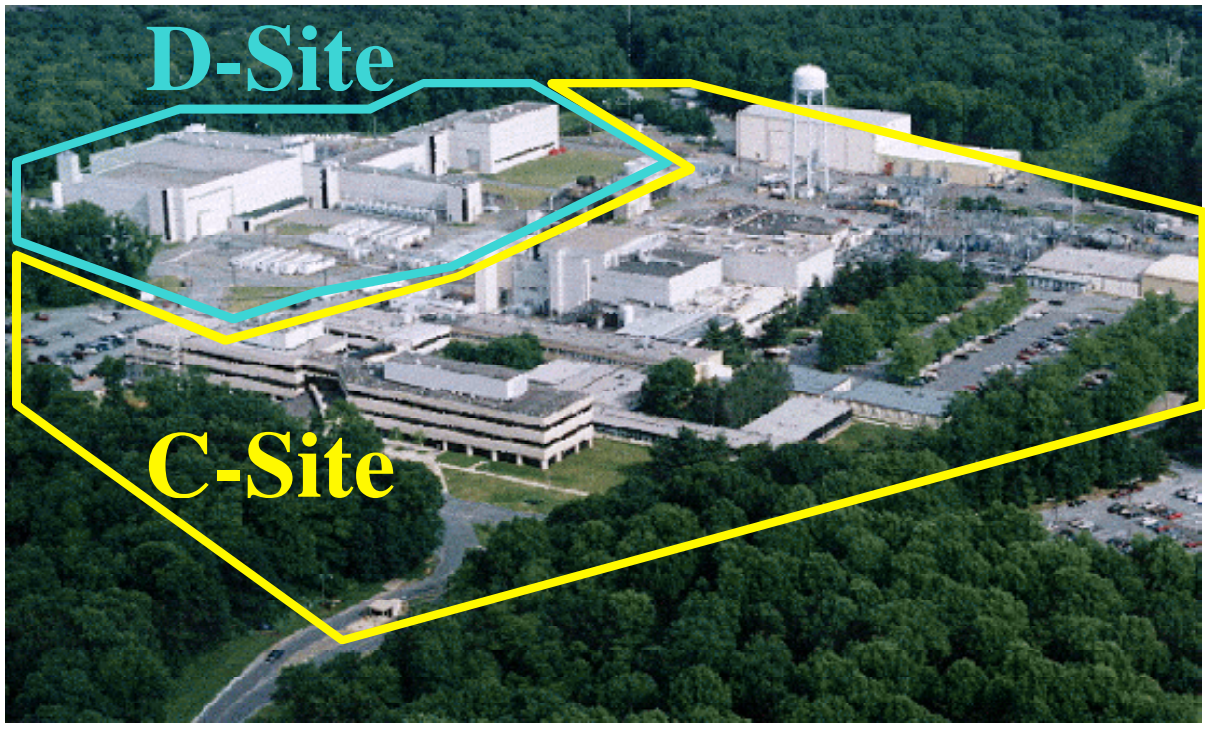
The Princeton Plasma Physics Laboratory (PPPL) is operated by Princeton University for the Department of Energy under contract DE-AC02-76CH03073. The PPPL FY 2004 total funding was $77.8M; the FY 2005 current total funding is estimated a $79.2M and the PPPL estimated funding for FY 2006 is $125.6[1]. The current laboratory population consists of approximately 437 employees, and 125 visiting collaborators, subcontractors, students, temporary employees and guests on site on a given day. The Laboratory is located on 88.5 acres within the Princeton University Forrestal Campus approximately mid-way between Philadelphia and New York City. Princeton Forrestal Campus is one of the nation's premier university-associated office/research parks. The center provides an outstanding work environment with businesses, research institutions, and hotel/conference facilities in reasonable proximity to very desirable residential

[1] The Princeton Plasma Physics Laboratory numbers include funding for the ITER MIE project that will be managed by the United States ITER Project Office at PPPL. Nearly all of these funds will be passed through PPPL to laboratories, universities, and industrial firms. We anticipate that nearly all of these other institutions will be selected through a series of competitive, peer reviewed selection processes; making it impossible for them to be identified at this time. $1.0M of the budget was included for ITER in FY04, FY05 included $2.4Mfor ITER, and FY06 includes $55.5M for ITER.

communities. The 1,750-acre Campus is punctuated by dense woods, brooks and nearby streams; almost 500 acres remain in their natural state in order to protect and enhance the character of the Center. It is in this idyllic setting that the Plasma Physics Laboratory is centered. Over the last several years, the area surrounding the Laboratory has continued to develop with the construction of additional office and research buildings, emphasizing the importance of maintaining good community and external relations.

The Laboratory utilizes approximately 725,000 square feet of space in Government-owned buildings located on "C" and "D" sites [see Figure 1]. The Total Replacement Value (RPV) of all PPPL facilities and infrastructure is $371,870,140. Non-Programmatic RPV, used for calculating Indices, is $252,409,708. The Programmatic (OSF 3000) RPV is $117,437,306 and includes TFTR and NSTX equipment. The RPV of buildings only is $192,493,306[2]. There are twenty-seven buildings on C-Site, eight buildings on D-Site and one off-site. The existing contract between the DOE and Princeton University also provides for an ultimate build-out potential of approximately 900,000 square feet, allowing for the possibility of moderate expansion. The overall condition of the Laboratory's facilities is considered adequate. Presently, there are no known conditions that could seriously impact establishing new or expanding current missions.

Figure 1 – PPPL C- and D-Sites



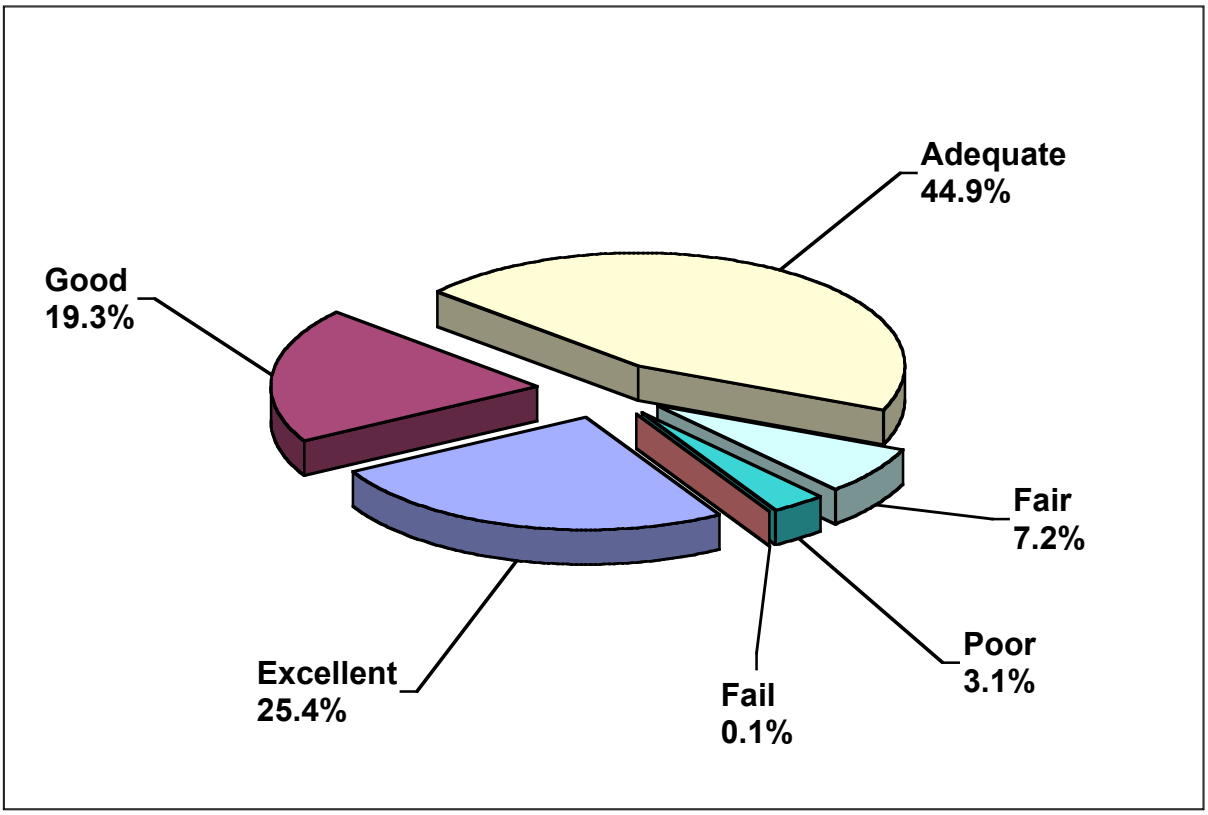
[2] The RPV of buildings only is $192,493,306 includes the C-Site Cooling Tower Pump-house and the D-Site Tritium Support Facility. These two structures will be removed, but have not been deleted from the RPV at this time because each structure still exists and has an RPV in FIMS.

The Department of Energy adopted the Facility Condition Index (FCI) as a tool for measuring the condition of its facilities. DOE Order 430.1B defines the FCI as the ratio of the cost of deferred maintenance to the facility's replacement plant value. The FCI for all PPPL non-programmatic facilities is 4.38%[3] and considered "Good". Where FCI values are rated as follows:

Excellent:	FCI <2%
Good:	FCI is from 2% to <5%
Adequate:	FCI is from 5% to 10%
Fair:	FCI is from 10% to <25%
Poor:	FCI is from 25% to <60%
Fail:	FCI is 60% or greater and replacement is required.

Space and building information (as of April 2005) is displayed in Figures 2 through 4.

Figure 2. Condition of Laboratory Buildings



This chart shows the condition of PPPL Buildings (i.e., excludes other facilities) indicated as a percentage of total gross sq. ft. The .1% for the Fail category is due to the off-site Canal Pump house that will be repaired as necessary or replaced. The 3.1% for the Poor category includes the

[3] The ratio of DM (excluding trailers) $11,059,666 to the RPV (non-programmatic) $252,409,708 = 4.38%.

Material Storage Building, CAS Building and Theory Building. The Material Storage Building, used for temporary storage of hazardous materials, will eventually be removed. Consideration is being given to consolidating hazardous material storage in the Radiological Waste Storage Building, which will allow removal of the Material Storage Building. The CAS Building is being repaired over the next several years, including a new roof and HVAC. Plans call for the eventual removal of the Theory Building; in the near term the building will be repaired as necessary.

Figure 3. Use of Laboratory Space

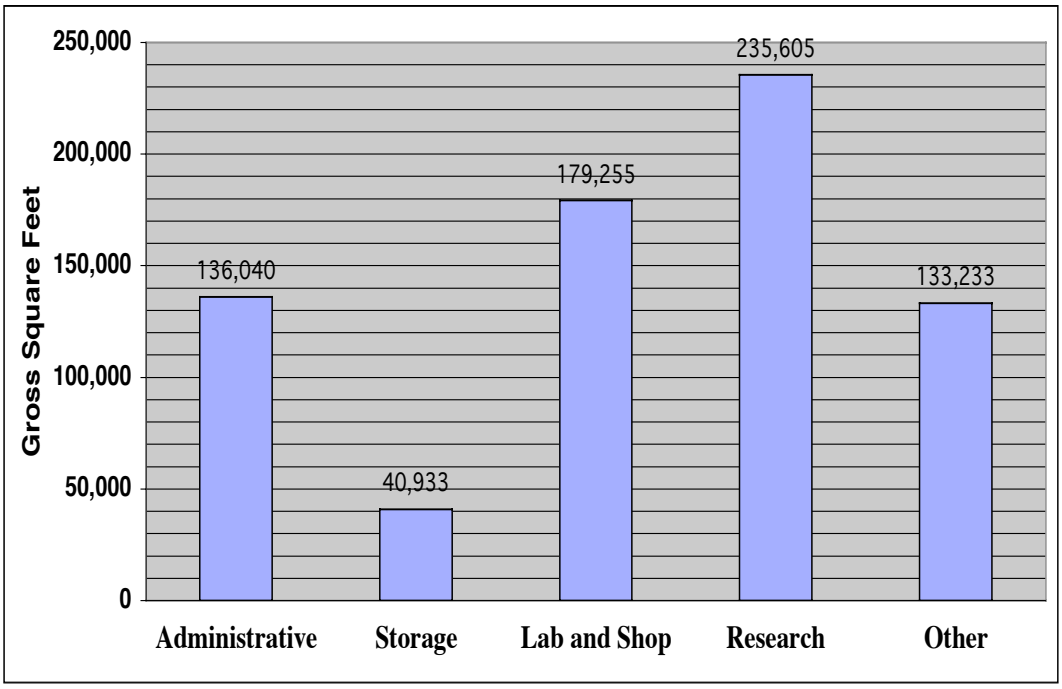
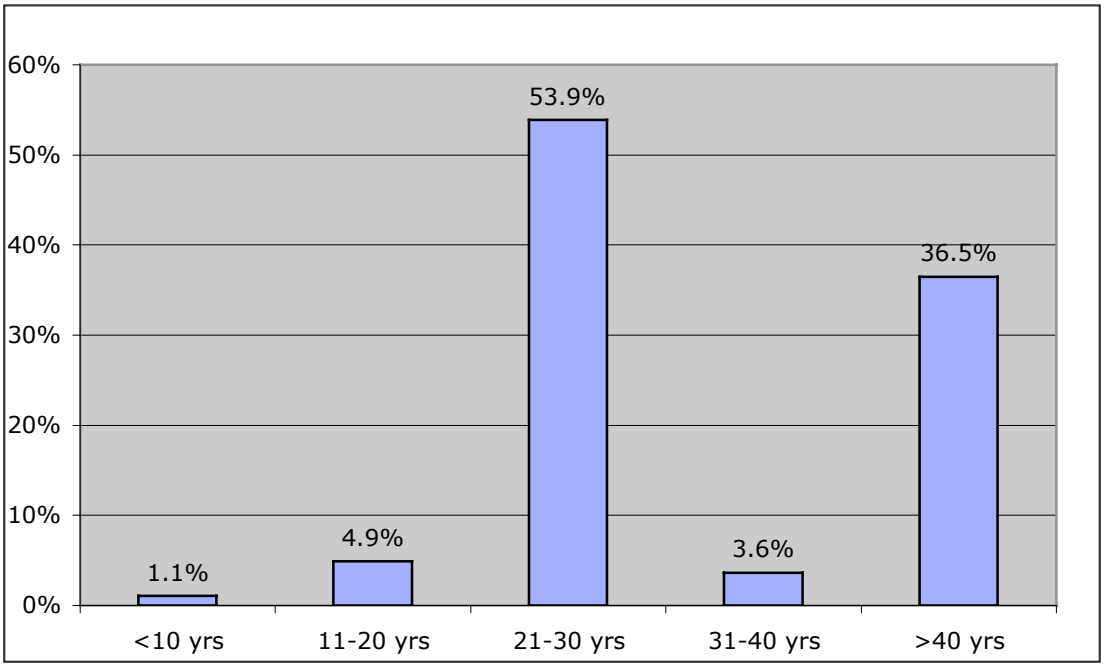


Figure 4. Age of Laboratory Buildings



[Indicated as a percentage of total gross sq. ft.]

III. PPPL Mission

This plan and the PPPL mission are consistent with, the DOE Strategic Plan (DOE/ME-0030), the Office of Science Strategic Plan, and the Office of Science Publication "Facilities for the Future of Science: A Twenty Year Outlook." The DOE FY 2006 Congressional Budget Request (CBR) recognizes that SC has responsibilities in three main areas: selection and management of research; operation of world-class, state-of-the-art scientific facilities; and design and construction of new research facilities. Consistent with the FY 2006 Congressional Budget Strategic Highlights document, the PPPL mission, competencies, and Facilities Supporting Missions are outlined in this section of the TYSP.

The goal of the United States Fusion Energy Sciences Program is to provide the knowledge base for fusion as an economically and environmentally attractive energy source. PPPL contributes to the Department's Science mission by developing the fundamental theoretical, experimental and technological understanding needed to make fusion energy practical and affordable. As DOE's only program dedicated laboratory for plasma physics, it is of crucial importance that PPPL work closely with the entire U.S. community. This role places PPPL in the position of being a collaborative national center. Many visitors work on our experiments and within our facilities, and in exchange, many members of our staff collaborate on other experiments around the world.

The major PPPL "Facilities Supporting Missions" are:

• **The National Spherical Torus Experiment (NSTX)** began operation in FY 1999. The spherical torus is an innovative fusion plasma confinement system, with the proven capability to

confine stable plasmas at high beta (ratio of plasma pressure to magnetic field pressure). Research on NSTX will considerably broaden the scientific scope of high temperature plasma physics.

• **U.S. participation in the ITER Burning Plasma Physics Experiment.** PPPL, in partnership with Oak Ridge National Laboratory, is leading the U.S. efforts in this collaborative international science endeavor which is currently the subject of intensive negotiations targeted at producing the first fusion experiment capable of sustained production of fusion energy. It is a necessary step toward the ultimate realization of fusion power as a viable alternative to current sources.

• **The National Compact Stellarator Experiment (NCSX)** is currently under fabrication by PPPL (lead) and Oak Ridge National Laboratory for planned operation beginning in FY 2009. This innovative magnetic confinement experiment is the product of years of theoretical analysis and computer modeling. It is predicted that by confining the plasma within a highly optimized set of external coils, a very robust, stable plasma will result that is naturally capable of continuous operation at high temperatures and densities. The results of the experiment will greatly enhance our understanding of toroidal confinement for devices such as ITER and its successors.

Programmatic Goals

The U.S. Department of Energy announced in July 2004 that the U.S. Project Office of the International Thermonuclear Experimental Reactor (ITER), a major international fusion experiment, will be located at Princeton Plasma Physics Laboratory (PPPL). PPPL, in partnership with DOE's Oak Ridge National Laboratory (ORNL), will be responsible for overseeing the U.S. ITER Project Office and providing it with the requisite staffing and facilities. The United States and its international partners are in the planning stages for ITER, which is a critically important experiment to understand the physics and technology associated with a burning plasma.

The U.S. ITER Project Office at PPPL will be responsible for project management of U.S. activities to support construction of this international research facility. These will include securing technical assistance from the U.S. fusion community; procuring and shipping U.S. hardware contributions; arranging for U.S. personnel to work abroad at the ITER site; representing the U.S. with the international ITER organization on construction and preparation for ITER operations; and coordinating and integrating the U.S. fusion community's ITER project activities with the international ITER project.

The ITER international fusion experiment was priority number one in "Facilities for the Future of Science: A Twenty-Year Outlook", a proposed portfolio that Secretary Abraham released in November 2003 to serve as a roadmap for future scientific facilities to support DOE's Office of Science mission. [4]

[4] **U.S. DOE News Release, Tuesday, July 13, 2004**

The last several years have been a time of considerable success at PPPL. A broader focus on approaches to innovation in fusion and a wider recognition of the impact of PPPL's efforts on other areas of science and technology have been hallmarks of this period.

Large Experimental Devices

A central element of the domestic Fusion Energy Sciences Program is "Innovative Confinement Configurations." PPPL has helped lead the national community in nurturing the best new ideas in plasma confinement both in advanced tokamaks and in innovative confinement configurations. The key theme of the PPPL research program is to achieve innovation through deeper scientific understanding. Two major experimental projects, the National Spherical Torus Experiment (NSTX) and the National Compact Stellarator Experiment (NCSX) will anchor the Laboratory's concept improvement program for the next several years.

The spherical torus configuration is an innovative confinement configuration, which has the promise to combine stability at reduced applied magnetic field with good energy confinement. These properties flow from the combination of toroidal topology with an overall spherical shape. The role of the central core of the device is minimized without sacrificing its strong stabilizing influence. This advanced configuration may allow a relatively inexpensive fusion system to achieve high levels of fusion power in a compact size. The mission of NSTX, a national Proof-of-Principle spherical torus experiment, is to test this configuration at a scientifically relevant scale, but at minimum cost. By utilizing over $170M of PPPL site credits, a world-class, low cost device was constructed as a joint project that includes PPPL, Oak Ridge National Laboratory (ORNL), the University of Washington, and Columbia University. The NSTX Facility is being operated by PPPL as a national facility with collaborators from universities, industry, and national laboratories. The NSTX first plasma was achieved ten weeks ahead of schedule on February 12, 1999. In FY02, a plasma current of 1.5 MA (50% over the design value) was achieved. A toroidal beta approaching 40% was achieved without active feedback control. "H-confinement mode" plasmas were sustained. In the light of this encouraging progress, options for upgrades to NSTX are being developed.

A successful outcome of the NSTX program would be to establish the foundation for an innovative national spherical torus experiment at the Performance Extension scale. An example of such an experiment could be a next step spherical torus (NSST) designed to achieve 5 - 10 MA in plasma current and, if performance projections are realized, to operate with deuterium-tritium fuel, thereby taking full advantage of the facility that is now available as a result of the decommissioning and decontamination of the Tokamak Fusion Test Reactor (TFTR). Based on the encouraging high performance H-mode high-beta discharges on NSTX, it is envisioned that the NSTX may be able to supply the physics base needed for the physics validation of NSST in the next five years. This would enable the design and construction of NSST to proceed during the following five-year period.

The Laboratory's other major innovative confinement configuration initiative is the Compact Stellarator, which offers the attractive possibility of a disruption-free toroidal plasma that would operate in steady-state without external current drive, rotation drive or feedback systems. A proof-of-principle experiment based on the "quasi-axisymmetric" stellarator concept (QAS), the National Compact Stellarator Experiment (NCSX), is being designed by the Laboratory in partnership with the Oak Ridge National Laboratory. The NCSX will be used to investigate the effects of three-dimensional plasma shaping, of internally- and externally-generated sources of

rotational transform, and of quasi-axisymmetry on the stability and confinement of toroidal plasmas. Results from NCSX will be used to quantify the physics benefits of compact stellarators, passive stability and tokamak-like confinement including the ability to manipulate the turbulent transport with flows.

The NCSX project successfully completed a Department of Energy (DOE) peer review of its physics basis and physics design approach in 2001. The Fusion Energy Sciences Advisory Committee (FESAC) designated the NCSX as a proof-of-principle experiment, one which will examine a broad range of physics issues and provide the physics basis for assessing the concept's attractiveness for fusion energy and planning next steps. The FESAC said that the potential fusion gains "earn for the compact stellarator an important place in the portfolio of confinement concepts being pursued by the US Fusion Energy Sciences program." The DOE Office of Fusion Energy Sciences approved Critical Decision 0, Mission Need, authorizing the project to begin conceptual design. The Department requested $11M in its FY03 budget submission to Congress to initiate the project. A successful DOE-SC conceptual design review of engineering, physics, cost and schedule took place on May 2002. Following approval of Critical Decision 1, Title I design began in October 2002. Critical Decision 2 approval was granted in February 2003, which formally established the project baseline, the technical objectives, budget, and schedule. The NCSX project passed a crucial milestone in September 2004 with the approval of Critical Decision 3 (CD-3), Start of Fabrication, by Dr. N. Anne Davies, Associate Director for Fusion Energy Sciences in the Office of Science. The decision was based on the results of three in-depth reviews during the preceding months, which examined the project's readiness to begin fabrication from technical, cost, schedule, and management standpoints. With the approval of CD-3, the project began fabricating the production components for the facility, starting with the award of subcontracts for the vacuum vessel sub-assemblies and modular coil winding forms. Project operations are scheduled to commence in 2009.

Theory and Computation

With recent advances in computational power, capabilities to study all areas of plasma science have greatly expanded. PPPL has strong capabilities in linear and nonlinear simulations of transport phenomena, of macroscopic stability, and of the effects of energetic particles in plasmas. In addition to the goal of understanding plasmas, PPPL Theory and Computation contributes strongly to innovation in plasma confinement concepts, such as the spherical torus, the stellarator, feedback stabilization of tokamaks and stability of the Field Reversed Configuration. As a result, PPPL functions as a center for national and international collaboration in a broad range of areas of plasma science, which encompass fusion research and other areas of plasma scientific inquiry as diverse as space physics and the plasma thrusters. The PPPL Theory Department also plays a key role in the Princeton University Graduate Program in Plasma Physics.

In response to a request from the Office of Fusion Energy Sciences (OFES), PPPL has led a national effort to establish a Plasma Science Advanced Computing Institute (PSACI), which was stimulated by the need for to take advantage of advances in high-performance computer technology. PPPL supports the Scientific Discovery through Advanced Computing (SciDAC) and is funded to do research in microscopic modeling of turbulent transport, macroscopic modeling of large-scale plasma instabilities and RF modeling. PPPL is also a partner in the SciDAC Fusion Collaboratory.

Off-Site Research

Members of the PPPL research staff are participating in experiments at leading national and international facilities, thereby contributing important skills to the host teams, while strengthening the PPPL scientific program. National and international facilities provide opportunities for cutting-edge scientific research. While contributing to the programs at these facilities, PPPL scientists are taking advantage of resources at the Laboratory in the areas of theoretical support, diagnostic and radio frequency (RF) development, and integrative data analysis. This provides an excellent platform to address a wide range of key issues of fusion plasma science. Key interests of PPPL collaborators include advanced confinement regimes, magneto-hydrodynamic (MHD) stability, RF physics, supra-thermal particle effects, and divertor physics.

In addition to scientific personnel, experienced engineers are contributing to the operations teams at DIII-D (located at General Atomics) and C-Mod (located at the Massachusetts Institute of Technology), and are helping with the design and construction of upgrades and modifications to these devices.

PPPL believes it is scientifically productive to maintain collaborative scientific teams. Even with a second proof-of-principle device on-site, NCSX, PPPL will still want to maintain a collaborative program at a substantial level. In addition to the sharing of needed expertise, the general scientific cross-fertilization that results from these collaborative programs is extremely important for the success of the Fusion Energy Science Program. For similar reasons, PPPL plans for strong incoming national collaboration on NSTX and other PPPL facilities.

Burning Plasma Experiments

The 1998 FESAC Panel Report and the 1999 Secretary of Energy Advisory Board (SEAB) report supported the development of a burning plasma experiment. The fusion community, including PPPL, has been participating in the Next Step Options program to develop a concept for a minimum cost tokamak burning plasma experiment, called FIRE. The U.S. rejoining the ITER project will allow the US scientists an opportunity to study burning plasma physics in a large-scale, high-duty-factor device. In 2004, the DOE announced that PPPL will host the U.S. ITER Project Office.

Plasma Science and Technology

Small-scale experiments are undertaken at PPPL in the areas of basic plasma physics, innovative fusion concepts, and applied plasma technology. This research diversifies the Laboratory's program, strengthens our connections with other fields of science, such as high energy physics and space physics, and plays an important role in the training of graduate students and postdoctoral associates. Exciting proposals have been accepted such as the use of lithium on the Current Drive Experiment-upgrade (CDX-U) facility. The Laboratory also encourages technology transfer from fusion research to address the near-term needs of the nation, such as plasma processing technology, and improved plasma thrusters for communications satellites.

The Graduate Program in Plasma Physics and Science Education

The Laboratory places great importance on the continuation of its close relationship with the Princeton University Program in Plasma Physics. The Program, with over 200 Ph.D. graduates since its inception, provides training in plasma physics relevant to magnetic fusion, as well as in the broader field of plasma science. The scientific diversity of PPPL, as well as its outstanding

capabilities in magnetic-confinement fusion, continues to attract the highest quality students to the Program. Within the School of Engineering, the Program in Plasma Science and Technology brings together students from a broad range of departments involved in plasma studies, building ties to fusion plasma science. The Science Education program serves undergraduates and students and teachers in grades K-12. Programs include scientific research experiences, partnerships with school districts, teacher staff development, and curriculum development with an emphasis on Internet-based science investigations for students.

University Relations

Princeton University is the contractor for the Department of Energy. As such, the Laboratory places great importance on the continuous strengthening of its close relationship with the Princeton University. The Laboratory as well as the University benefit from the collaborative relations that occur in a number of Departments and Programs – Astrophysical Sciences, Computer Science, Mechanical and Aerospace Engineering, Applied Mathematics, the Princeton Materials Institute, the Center for Energy and Environmental Studies. By synergistically utilizing these resources both organizations benefit from the exchange of ideas and personnel.

IV. Facilities and Infrastructure (F&I)

The Princeton Plasma Physics Laboratory is located on 88.5 acres within the Princeton Forrestal Campus located approximately mid-way along the corridor between Philadelphia and New York City. Princeton Forrestal Campus is one of the nation's premier university-associated office/research parks. The Center provides an outstanding work environment with businesses, research institutions, and hotel/conference facilities in reasonable proximity to very desirable residential communities. The Laboratory utilizes approximately 725,000 square feet of space in Government-owned buildings located on “C” and “D” sites. There are twenty-seven buildings on C-Site, eight buildings on D-Site and one off-site. The existing contract between the DOE and Princeton University also provides for an ultimate build-out potential of approximately 900,000 square feet, allowing for the possibility of moderate expansion. The overall condition of the Laboratory's facilities is considered adequate. Presently, there are no known conditions that could seriously impact establishing new or expanding current missions. A Site map showing buildings and site layout can be found in Attachment 1. A listing of buildings, conditions, square footage, and utilization is contained in Attachment 2.

Strategic F&I Goals:

The vision of the organizations that provide infrastructure support is to make the contributions to PPPL and the DOE that enable the Laboratory to reach its full potential as a world leader in fusion and plasma physics science research. Related objectives include:

- Prevention of injuries and minimization of exposure to workers, the public and the environment to radiation and hazardous materials;
- Protection of DOE and Princeton University property;
- Compliance with environmental regulations;
- Operation of facilities in a manner that is efficient and cost effective; and
- Maintenance of an attractive and fully functional facility.

A modern, effective, and efficient physical infrastructure is of critical importance to maintaining PPPL's ability to continue world-class scientific leadership and research in support of the missions of the Office of Science and the Department of Energy (DOE) into the 21st Century. When developing plans and costs for new construction and facilities modifications consideration is given to flexibility, versatility, durability, longevity, use of sustainable design principles, rate of return and reducing operating and maintenance costs.

- **Mission:** The laboratory's facilities and infrastructure will be adequate to accommodate each laboratory's expected programmatic mission activities and technological changes well into the 21st century. Facilities will be "right-sized" to the type and quality of space and equipment needed to meet mission needs. Activities and organizations that need to be co-located will be. Facilities will be readily adaptable to changing research requirements and technologies. Off-site leased space will be reduced where economically appropriate.

- **Working Environment:** The laboratory will achieve a quality of facilities which provides a "preferred" working environment for our researchers that helps attract and retain high quality staff. The laboratory will employ the latest advances in information technology to enhance worker productivity, interactions with other scientists, and the advancement of science. Quality training and conferencing facilities will be available. Visiting scientists will have access to quality accommodations and to research support facilities.

- **Environment, Safety, Health and Security:** The laboratory's F&I will provide a safe, healthy, and secure working environment for laboratory employees and visitors. Retired facilities will be removed and environmental cleanup will be completed. The Laboratory will be viewed as a good community neighbor.

- **Operations and Maintenance:** F&I will be efficient to operate and maintain.

Property management personnel will continue initiatives to review and dispose of property that is no longer needed to support current or planned PPPL operations. Laboratory management and project personnel continue to review site equipment and material to identify assets that are surplus to PPPL's needs. These reviews include assets in-use and held in storage, spare parts, and common-use stores inventory. The disposition strategy for property declared excess will be to apply assets to an ongoing or planned projects, distribute assets to other DOE labs or federal agencies, and donate or sell the assets through the General Services Administration's various disposition programs.

V. Facility and Infrastructure Issues

With the exception of the TFTR-related construction (1980-1982), most of the PPPL buildings and facilities are at least 30 years old, and, although structurally sound, require renovations to extend their use or to adapt them to house new programs.

Adequate space exists for PPPL's fusion devices, as well as for current and future non-fusion plasma science and technology projects. The pressing issue is the need to refurbish existing areas in order to support current and future work. The prime example is the National Compact Stellarator Experiment (NCSX), which is beginning construction. Improvements to the buildings, shops, storage areas and offices in proximity to the NCSX Test Cell are needed to support the project during construction and operation and eventually to provide office space for new scientific collaborators. Space will need to be more efficiently utilized to make room for the displaced operations. Several renovations and GPP projects are planned for the next two to three years to ready these facilities for NCSX.

Increasing demand for smaller laboratory areas where Principal Investigators and students can conduct research heightens the need to refurbish underutilized space. The same holds true for offices that are not currently occupied, but must be refurbished before they can be used. Good quality office space is nearly fully utilized and during peak periods in the summer, when there is an influx of students, office space is at a premium. The need for office space will increase over the next several years as a result of the DOE decision to site the U.S. International Thermonuclear Experimental Reactor (ITER) Project Office at PPPL. PPPL and ORNL are partnered to host the U.S. ITER Project Office at PPPL. Renovations will be made to underutilized office space in the Engineering Building and other areas in order to allow allocation of the necessary space for the ITER Project Office and our visiting collaborators.

Over recent years, the Laboratory has consolidated staff into the main buildings and disposed of older outlying buildings. This trend has enabled a reduction in expenditures and we will continue to pursue this strategy. The Director's Office, the DOE Office, research and engineering groups and most administrative support activities are now centrally located at C-Site while NSTX is the primary experimental facility at D-Site. Several dozen personnel trailers have been eliminated along with several modular buildings since 1993. However, there is little room for fluctuation in staffing as visitors, students and collaborators come and go. Most often, office space requests are for visitors in the NSTX, Theory and Plasma Science & Technology groups. Requests for office space are, at times, difficult to accommodate within a reasonable proximity. On the other hand, there are areas of experimental, shop and lab space not being used because the activities they supported are no longer funded. These areas are generally within older facilities, and are largely underutilized. However, they are difficult to excess due to the fact that they are contiguous to other fully utilized facilities. Ways of taking advantage of this trend of underutilization has opened innovative opportunities to renovate some underutilized shop and lab space. For example, the RF building is undergoing staged renovations. Outdated laser lab areas are being renovated for use as a Science Education Laboratory and learning facility. Other outdated labs in the RF building are being prepared as the new location for the Health Physics Calibration and Service Laboratory (CASL). Another example of ongoing consolidations is the reclamation of a former machine shop area for use by the new NCSX project, which will also consolidate a smaller machine shop from the second floor of the Lab Building. Subsequently the area to be vacated by the small machine shop will be converted for use by small experiments.

The long-term plan to consolidate personnel and functions, and reduce reliance on high maintenance, temporary and facilities in poor condition continues. The D-Site Tritium Module and the Health Physics Calibration and Service Laboratory (CASL) modules are scheduled to be

demolished in FY05. A proposed West Wing Addition to the Lyman Spitzer Building (LSB) is to replace the existing Theory Wing, Administration Wing and Module VI, which are facilities with high maintenance costs that would be demolished upon completion of the proposed West Wing Addition. Studies into consolidating operations from the Hazardous Waste Storage Building into the relatively new Radioactive Waste Building are also being investigated. This would allow the demolition of the Hazardous Waste Storage Building and more efficient and centralized services, which are all provided by the Materiel and Environmental Services Division.

Storage space and parking are adequate, although, storage is sometimes more remote than desired. Several storage areas need to be cleaned up and outdated equipment must be excessed, as construction of NCSX will make consolidation of storage and shop space a more pressing issue in FY06, especially in the vicinity of the NCSX Test Cell. Renovation of the 2nd and 3rd floors of the RF building for use as short-term and medium-term storage of experimental equipment is being considered.

A. Condition Overview

The following paragraphs describe the site, buildings and utility systems and their condition. A table of Asset Condition Indices (ACI) can be found in Attachment 2.

According to the Facility Condition Index (FCI) data for active buildings provided by DOE-SC guidance and based on March 1, 2005 FIMS data, the PPPL FCI is 4.38% and considered "Good". This compares favorably to the overall DOE-SC average of 7.78%, which is considered "Adequate".

1. Buildings

The buildings at PPPL are relatively diverse and include space for large-scale experimental facilities; smaller Laboratory sized experiments, research offices, and administrative support offices. The historical development of the Laboratory from its original construction in the late-1950's was marked by periods of growth around the inner core of eight original buildings to the thirty-six buildings that exist today. The largest single period of growth was associated with the construction of the TFTR facility at D-Site in the late 1970's, which now houses NSTX. The structural integrity of the buildings is sound although there are two smaller buildings that did not meet regional seismic criteria during a review performed in 1998. Consistent with governing regulations and based upon their function, age and value, they were designated as not requiring rehabilitation.

2. Site Utility Systems

Process Water System (Canal Water)

Process water is taken by agreement with the State of New Jersey, Division of Water Resource (NJDWR), from the Delaware and Raritan Canal. It is filtered, chemically treated, and pumped into a 250,000 gallon elevated storage tank at C-Site. The pumping station, which is located at

the Canal, consists of three pumps with a capacity of 600 gallons per minute (GPM) each. Two of these pumps are electrically driven, while the third is driven by a diesel engine for use during power interruptions.

From the elevated tank, a network of underground piping distributes the canal water to points of use for process cooling and for fire protection. Process water after use is returned to the Cooling Tower or discharged into the storm drainage system and eventually into Bee Brook. The NJDWR Permit allows a maximum of 500,000 gallons of water per day to be removed from the Canal. Annual use reports are filed with the New Jersey Department of Environmental Protection (NJDEP), Bureau of Water Allocation. The existing fire protection piping network is combined with the process water system. The elevated 250,000-gallon tank supplies a ductile iron pipe network, which supply fire hydrants and building fire protection systems. The piping system is in good condition as the old transite piping has been replaced via a multi-phase GPP project. Eight additional fire hydrants are connected into the potable water system in case of a failure of the canal water system. A tie-in of PPPL's potable water supply and canal water systems (with back-flow prevention) provides two independent water supplies for fire protection. The canal pump house, although small, is categorized as “Fail” and requires upgrades to an acceptable condition.

A substantial amount of the underground distribution piping was constructed using ‘transite’ materials. Transite is a composite of asbestos and cement and has demonstrated a tendency to fail when the surrounding earth has been disturbed. A multi-phase project replaced the portions of the underground system that contained transite pipe with a new cement lined ductile iron pipe. The project is nearly complete, with only some minor building tie-ins to be completed in FY05.

Potable Water
Potable Water is supplied by the Elizabethtown Water Company, a regulated public utility. The water supply is a single 12” pipeline that enters C-site at the northwest boundary. The supply line is fully metered, valved, and utilizes a back-flow preventors to preserve system integrity. After passing through a metering station, potable water is distributed throughout C and D-Sites in an underground piped network. PPPL has been informed by the Elizabethtown Water Company that they need to replace the meter shortly. This will be coordinated closely to minimize operational impacts. Average usage is approximately 67,000 gallons per day (GPD).

Similar to the process water system described previously, a substantial amount of the underground distribution piping was also constructed using ‘transite’ materials. Transite is a composite of asbestos and cement and has demonstrated a tendency to fail when the surrounding earth has been disturbed. The transite portions of the underground system were systematically replaced.

Sanitary Sewage System
All sanitary sewage at C and D-Sites is conveyed from buildings by an underground piped network to the main sewer line that exits at the northern boundary. The line is part of the system operated by the Stony Brook Regional Sewage Authority (SBRSA). It flows to a sewage treatment plant located in nearby South Brunswick Township. The D-site Experimental Areas utilize intermediate holding tanks which permit sampling of wastewater before draining to the

sanitary sewer. There are three Liquid Effluent Collection Tanks (LECT), each with a capacity of 15,000 gallons that are used to temporarily control effluent from the D-Site experimental facilities until the water can be appropriately analyzed for release to the sanitary system. Valve and pump seals repacking will be required for the LEC Tank piping in the near future.

Storm Water System
Storm water from building roofs and paved areas is intercepted by a system of catch basins and drains, and piped via the shortest distance into several drainage ditches sloping generally southward. Canal water used for process and once-through cooling is also discharged into the storm water collection system. Waste from the de-ionization process is treated and also discharged into the storm system. The latter outfall has a residual salt content at discharge that flows to the detention basin and is a monitored in accordance with the New Jersey Pollutant Discharge Elimination System (NJPDES) permit.

Process cooling water is discharged at the D-Site Cooling Tower and enters Bee Brook via a southwesterly drainage ditch. This discharge, along with storm water and ground water pumped from building foundation sump, passes through a lined, monitored, automatically controlled detention basin prior to discharge into Bee Brook. The detention basin has an automatic oil detection system that prevents releases if oil is detected. The oil detection system is scheduled for replacement within FY05. Maximum outflow from all sources is approximately 1.5 million gallons per day with an average of 0.50 million gallons per day. The Laboratory has a current NJDEP surface water permit to discharge into the Bee Brook.

Heating Ventilation & Air Conditioning

In general, the existing heating, ventilating and air conditioning systems (HVAC) consist of equipment installed during the last 40 years. The majority of this equipment is in reasonably good operating condition, but some of it is old and is at or near the end of its operating life. Steam and chilled water are supplied from a central plant located in the Maintenance Building. Boiler operators provide round-the-clock coverage when boilers are in use.

Chilled Water
Chilled water for air conditioning for most of the C and D-Site complex is provided by the Central Chilled Water Plant (CCWP) located in the Maintenance Building. The CCWP consists of three 530-ton high efficiency chillers installed in spring 2002, which use non-ozone depleting refrigerants. Four new chilled water pumps with variable frequency drives and two new condenser water pumps also with VFDs and a new control system were also installed at the same time.

Some areas at C and D-Site are air-conditioned by packaged direct expansion units with independent heat rejection devices. Computer and electrical rooms are also cooled by independent units. These areas are being considered for conversion to chilled water and future expansion of the CCWP for economy purposes. This would reduce the site inventory of refrigerants and better utilize the D-Site Cooling Tower for heat rejection.

Steam
The existing boilers are packaged, fire-tube type, producing 100 psi steam, firing natural gas as the primary fuel with No. 2 fuel oil for back-up, with a total installed capacity of 1,350 boiler horsepower (BHP). The fuel oil pump and heater sets, boiler feed water and chemical treatment equipment are located in the Maintenance Building. Fuel oil is supplied by a 25,000 gallon above ground storage tank. The backup fuel was changed from No. 4 fuel oil to No. 2 fuel oil at the end of FY2004 and into the beginning of FY2005 to reduce emissions and improve maintainability of the steam boilers. Steam is distributed to the buildings via both overhead and underground insulated lines. The present steam demand can be met with approximately 700 BHP. The fuel oil storage tank holds approximately a two-week supply of oil. An 8-inch "interruptible" gas supply to the boilers provides dual firing capability

D-Site Cooling Tower
The D-Site Cooling Tower and pump house, located opposite the Maintenance Building and just south of the C-Site Cooling water pump house, provides cooling water for various D-Site and now also C-Site process equipment. The cooling tower is a two-cell, induced-draft, counterflow configuration manufactured by B.A.C. Prichard. It is capable of 102,390,000 BTU/HR at 17,030 GPM. It will evaporate approximately 10,200 gallons per hour and blow-down 2,040 gallons per hour.

The sump capacity is 150,000 gallons while the entire system inventory is 250,000 gallons. The concrete sump has six multistage vertical turbine pumps located in the adjacent pump house. There are three 600 HP (7,125 GPM) pumps and one 60 HP (1,650 GPM) pump that provide cooling water to the process chillers and equipment. There are also two 100 HP (1,820 GPM) pumps that provide condenser water to the HVAC chillers. Canal water filtered through two recently installed multi-media sand filters are used for make-up of this tower, with potable water for back-up. The D-Site Cooling Tower is in need of major repairs and eventual replacement, which is a candidate project for DOE-SC Deferred Maintenance Reduction funding.

C-Site Cooling Tower
The C-Site Cooling Tower was demolished in 2004 as part of the long-term plans to consolidate facilities, and reduce reliance on high maintenance facilities. Prior to demolition, the Tower was bypassed with a cross connect to the D-Site Tower. The C-Site pump house had been used to provide condenser water to the process chillers and other equipment including the original (1959) motor-generator (MG) sets. The tower consisted of two wood-filled tower cells with three 5,000 GPM vertical pumps located in the adjacent pump house. The tower capacity was 15,000 gallons per minute (GPM) with a 13-degree drop (from 98°F to 85°F), or 75,000 GPM BTU/HR. The C-Site Cooling Tower was 40 years old and in very bad condition. The upper fan exhaust towers and baffles were damaged and the structural connecting bolts were corroded. After the removal of the C-Site cooling tower, the concrete basin and the pump house remained. The C-Site Pump House is expected to be demolished, perhaps as early as FY2006, depending on resource availability. The removal of the pump house will require the installation of a new electrical feeder from substation #10 to the RESA Building as a required alternate source. After an engineering study to determine the Laboratory's future cooling capacity requirements, and consideration that the D-site cooling tower will eventually also have to be replaced, a decision

will be made if another cooling tower should be erected on the C-site Cooling Tower Basin. The basin would have to be reconfigured and the new cooling tower piped to the D-Site Pump house.

Natural Gas
The PPPL Central Boiler Plant, by design, utilizes either Natural Gas or #2 Fuel Oil. Operationally, Natural Gas is preferred as the primary fuel and during interruption fuel oil is used to support the Laboratory's steam and hot water needs. Public Service Electric and Gas supplies PPPL with Transportation Service Gas (TSG) for the Central Boiler Plant and Large Volume firm Gas (LVG) for the ESU and Module VI Buildings. Natural Gas Supply is arranged through a brokered process using the Defense Energy Support Center (DESC) as the contracting agent.

Building Control System and Energy Management
The temperature control systems are in good operating condition. A computerized Building Automation System (BAS) was installed in the fall of 1985 that has resolved many of the problems associated with the original controls. Moreover, the BAS has resulted in energy use reductions in C and D-Site HVAC systems through such operating features as night setback, duty cycle control, peak demand monitoring, start/stop time of optimization, and other energy conservation features such as enthalpy economizer controls.

The BAS is currently being expanded to include Direct Digital Control and monitoring of new and existing HVAC, lighting, mechanical and environmental protection systems to avoid energy waste during non-essential periods. In addition, the D-Site Experimental Area HVAC systems, currently not under BAS control, will be added to the system.

Utility Contracts
The PPPL In-House Energy Management Program includes providing appropriate control, organization, planning, and administration of utility contracts, and providing direct liaison interfaces with utility companies. Electric power is, by far, the largest utility expense. PPPL's objective is to obtain the most competitive price for electric power that meets the reliability requirements of the experimental program. Electrical energy for PPPL is provided by Potomac Energy Power Company (PEPCO) through a contract administered by the Defense Energy Support center (DESC). The State of New Jersey has adopted deregulation of the electric power market, and PPPL continues to work closely with DOE and the DESC to explore avenues for procuring reliable electricity at the best cost available. All electrical power to PPPL is routed through the Penn/Jersey/Maryland Regional Transmission Operator (PJM RTO) grid. This is the largest RTO in the nation.

In order to reduce the electrical energy demand costs, a PJM RTO software program (eData Program) operates certain PC's to monitor the cost of electrical energy as it changes on an hourly basis. . The eData program provides the opportunity and capability to control electrical demand (kW) and energy consumption (kWh) costs, thereby achieving cost efficiency.

PPPL M&O Division
PPPL also implements a maintenance program to ensure the efficient operation of buildings and timely correction of deficiencies. The Building Automation System has received upgrades and

efforts have commenced to incorporate additional buildings and equipment into the system for even greater energy saving opportunities. As new buildings are being designed, the design review process will incorporate Energy Star and Leadership in Energy & Environmental Design (LEED-NC 2.1) criteria. PPPL has one LEED Accredited Professional on staff.

PPPL's FY04 In-House Energy Management Program (IHEM) resulted in a reduction of 27.7% in building energy consumption per SF during FY04 vs. the FY85 Base Year. This compares with a NECPA goal of a 20% reduction between FY85 and FY00 and the Executive Order 13123 goal of 30% by FY05. These results demonstrate that PPPL is well on the way to meeting the DOE goals.

The use of interactive computer technology in this area has proven to be very useful and the Laboratory will continue to capitalize on this technology into the future. PPPL will continue to reduce energy consumption per square foot by efficient operations and applying new technologies whenever possible. Examples of such efforts include the following:

- The SIEMENS Apogee Building Automation System local interface panels will be upgraded until they are all Modular Building Controllers, which are the latest available technology and the communications trunk will be upgraded for high speed communication.
- Two requests have been submitted to FEMP for Technical Assistance Studies; one for a 100 kW photovoltaic (PV) array and one for an ice storage system to offset the electric load to one 530 ton chiller during high kWh price periods. The 100 kW PV study is in progress by FEMP and the ice/thermal storage study will be done by PPPL staff with the latest cost of electrical energy.
- PPPL will apply for FEMP funds when we see an economic opportunity to reduce energy consumption, prevent pollution and save operating costs.
- PPPL will receive $ 170,500 for a new energy & water efficient air compressor in May of 2005. Also “recommissioning” funding of 20 year old HVAC controls with DDC controls will be submitted in FY-06 to FEMP. Other DOE sites have received funds for this type of retrofit.

Electrical Systems

The main electric service to C and D-Sites is from a 138 kV overhead transmission line tapped directly to the Public Service Electric and Gas (PSE&G) Co.'s Trenton-to-New Brunswick overhead transmission line. This 138 kV line-tap feeds a pair of main disconnect switches and associated service entrance breakers which supply power to five 30/40/50 MVA transformers. Two transformers step the voltage down to 4.16 kV and feed most of C-Site. A third transformer steps the voltage down to 26.4 kV and feeds a portion of C-Site. The remaining two transformers step the voltage down to 13.8 kV and feed D-Site.

D-Site

Of the two 13.8 kV supply feeders to D-Site, one feeder supplies the D-Site experimental loads, including the two D-Site motor-generator (MG) sets. The other feeder supplies power to two 3.75/5.25 MVA, 13.8-4.16 kV transformers and a 'house power' ring bus via step-down transformers. This ring bus is fed by six 1.1 MVA transformers with 13.8 kV primaries and has

the provision of a standby feed from a 1.75 MVA transformer with a 4.16 kV volt primary. A 4.16 kV, 3.25 MVA standby diesel generator located on the east side of the D-Site MG Building, supplies standby power. This generator can also be interconnected to supply some limited capacity loads at C-Site on a temporary basis.

C-Site
A radial 4.16 kV and 26.4 kV distribution system, supplied from the aforementioned 138 kV step-down transformers, feeds experimental loads (including four motor-generator sets), "house power" loads, shops and approximately twenty-five unit sub-stations located throughout C-Site. The 4160VAC feeder Q3B8 from the C-site MG to the LSB penthouse (approx. 1300 ft.) was replaced in FY04. After FY05 C-Site standby power will be supplied by a new 4160 Volt, 1125 KVA diesel generator located outside the MG Building in the area formerly known as the Commutator Building. Maintenance and upgrades in FY04 included completion of the 138kV yard 5-year scheduled maintenance that included the replacement of the SF6 interrupters and disconnect blades on linebacker switch XD-2, and the disconnect blades on XD-3 linebacker, replacement of the LSB cafeteria electrical distribution system, and installation of a new programmable logic controlled alarm and emergency shutdown panel in the PPPL Computer Center that monitors the building power, the building fire alarm system and reports status to security headquarters. During FY05 the PPLCC UPS was upgraded from a 12kW to a 30kW unit. The proposed future NCSX power will require the installation of a switching power amplifier, at C-Site MG bay area, to be fed from either C-Site MG output or D-site MG/FCPC.

Communication Systems
Telephone System
The present telephone system utilized at the PPPL is a CENTREX III provided by Verizon. The system was installed in 1987 and is fed underground by a network of copper and fiber optic trunks. . The cable is terminated in the Frame Room (A117) at C-Site, multiplexed through an AT&T DDM 100 to a SLC96 switch and copper wire feeds interconnect all site buildings back to Verizon's main distribution frame located in the Frame Room. The fiber optics are multiplexed through the AT&T DDM 1000 to the SLC96 switch on site. House cable dates to 1958 in some areas. All station equipment is owned by PPPL. Approximately 40 cellular telephones provided by Verizon. Wireless telephones are also used by staff for Laboratory business. Approximately 35 Skytel nationwide numeric pagers provided by Skytel/MCI are also used by staff for Laboratory business.

Public Address Paging
The present system covers only D-Site and consists of corridor and ceiling speakers in the office areas, and horn speakers in high noise areas and building exteriors. Control of paging rests with the NSTX chief operating engineer during NSTX operations, with back-up microphones at the C-Site Security Dispatcher during other times.

VHF Radio Paging
PPPL owns and operates a Pocket-Paging system on 164.375 MHz. There are approximately 60 "pocket pagers" used by the staff for Laboratory business. The transmitter and antenna are located in the LSB Penthouse, and the encoders are in the C-Site Security Dispatcher Office. A

second base is installed at D-Site connected to the radiax antenna system to provide paging throughout the heavily shielded complex.

UHF Radio System
PPPL owns and operates a UHF radio network using four repeater channels and four simplex channels. The repeaters are located at D-Site and are connected to an aerial antenna as well as a radiax antenna in the basement of D-Site to enhance transmission throughout the complex. There is a receiver and aerial antennae located at B-Site on Forrestal Campus. There are approximately 80 portables, 10 mobiles, and three remote bases operating on these eight frequencies.

Video Conferencing
The Laboratory has a V-Tel Video Conferencing System installed in a room dedicated to that purpose. This system transmits graphics, video and voice to diverse locations to enhance information exchange. It is expected that the collaborative focus of PPPL will result in increasing demands for videoconferencing in the future. This may result in the need to enhance existing capabilities or provide new capabilities in the future, which will be accomplished through the General Plant Project Program.

Leased Services
The Laboratory presently leases alphanumeric pagers from SKYTEL, Inc. These pagers are carried by essential personnel to ensure they can be reached 24 hours per day, across the United States. The Laboratory utilizes Verizon Wireless cellular services for cellular telephone service. All phones are owned by the Laboratory and used by critical staff when away from the office for support of Laboratory Operations.

Fire Detection, Suppression and Alarm Systems
The Laboratory has automatic sprinkler protection throughout with only minor exceptions. In most cases the systems are ordinary wet pipe systems; although, in a few special cases other systems are used (Pre-action, dry or deluge). In areas where the value or programmatic importance warrants, smoke detection has been added. Special systems (Halon, CO_2, Wet Chemical, etc.) have been provided for special needs such as computer room sub floors and cooking areas.

All alarms controlled by building detection and suppression systems are reported to the Site Protection Division Communications Office via a state-of-the-art digital network with fiber optic connections and are displayed on a graphics terminal that can visually depict the location of the problem.

The Laboratory has begun the process of eliminating Halon use for environmental reasons. At this time, more than half of the Halon inventory has been taken out of service. As funding and program permit, additional reductions in Halon inventory will be made. In addition, efforts will continue to modernize D-Site and C-Site alarm system controls.

Security Services
PPPL's Safeguards and Security Program is designed to protect its assets, intellectual property, computational and other institutional resources ensuring that its scientific mission and

operational requirements as a DOE National Laboratory are sustained. PPPL updates its Site Safeguards and Security Plan annually. The Plan addresses potential threats and targets, identifies protection strategies and physical protection systems, protective forces, information security, property protection. Implementation of the PPPL Security Plan ensures that employees, collaborators, visitors and the general public work in or visit a safe and secure environment.

The task of providing protection for DOE sites and facilities continues to become increasingly complex due to the rapid changes that are taking place in the world. These recent changes have made it clear that PPPL and other federal facilities must continually assess their security countermeasures to provide requisite protection for facilities, staff, and visitors. Laboratory management and security professionals work closely with their DOE counterparts to ensure that the appropriate cyber, physical and personnel protection measures are in place.

PPPL's fundamental research subject areas are generally available in the public domain for civilian science purposes and aligned to university disciplines. PPPL does not conduct classified research or maintain classified information. Nevertheless, PPPL participates in the operational framework of the national laboratory system, with security considerations similar to other non-classified facilities such as Thomas Jefferson, SLAC and Fermilab. PPPL is fully committed to the implementation of policies that ensure the protection of sensitive information, including export sensitive information, personnel sensitive information, and computer operations and other related programs.

PPPL conducts operational activities and maintains confidential information relating to site security, computer security, property and material control, export control and other business areas such as personnel files.

Communications
All Site Protection Division vehicles are equipped with two-way radios for communication between the Emergency Services Unit (ESU), the Communications Center Dispatcher, and the vehicles. This radio system operates on a UHF radio frequency. The Site Protection Division uses portable radios, which are on the same frequency as the mobile radios. Two-way communication between portable units and mobile (vehicle) radios is possible.

As part of the Life Safety Code Project, the Emergency Voice Evacuation System (EVES) is fully activated. The system is tested weekly to ensure operability. The system provides coverage for all areas of C and D-Sites. EVES ensures that personnel are rapidly notified when there is a potential or confirmed emergency condition in a specific area of the facility or when the entire facility is affected.

Physical Security
Access to the PPPL facility is controlled by an Emergency Service Officer or gate arm at the Main Entrance, Security Booth #6. The security booth is staffed during normal work hours and remotely operated from the Communications Center after hours. The security booth is equipped with the following:

- Employee vehicle card reader entrance
- Visitor vehicle check point

- Automatic open/close gate arms for entrance and exit lanes
- Vehicle barriers for use during heightened security conditions
- Visitor lane exterior direct phone line to security
- Pan/tilt cameras monitoring the booths exterior operations
- Exterior (security) public address system
- Remote control capability from security dispatcher

C-Site Access
Access to buildings in the C-Site complex is protected by an Access Control and Alarm Monitoring System (ACAMS). Both C and D-Site are patrolled twenty four (24) hours a day car and foot patrols. Access to sensitive areas is protected by card reader access and door security alarm monitoring 24 hours a day. A major upgrade to the system was completed in September 2004.

D-Site Access
D-Site is surrounded by a perimeter safety fence that has personnel card reader controlled gates and automatic remote controlled vehicle gates with an exterior direct phone line to the Communications Center. D-Site building access and selected areas are protected by ACAMS.

Communication Center
A certified Communications Officer operates the Security Communication Center 24 hours a day. The Center is equipped with:

- Radio Communications with security, emergency services, operations and maintenance personnel.
- Pan/tilt cameras (control and monitoring).
- After hours visitor check point.
- Employee and emergency paging system.

B. Condition Assessment Process

The Condition Assessment Process at PPPL was revised in FY2004 to be more comprehensive and to meet new requirements established in DOE Order 430.1B, Real Property Asset Management. The Maintenance and Operations Division and the Power Engineering Branch of the Laboratory perform annual building and facility inspections as part of a revised Building Inspection Program. Each year, twenty percent of the Laboratory space, based on square footage of buildings, is inspected. The Maintenance and Operations Division establishes which Buildings will be inspected in order to meet the twenty percent per year guidance set forth by DOE. Each building is scheduled for inspection within a five year time frame.

Each building is inspected by lead craftsmen, who are experts in their field and Engineers using guidelines published by R.S. Means. All building systems are inspected including HVAC, electrical distribution, plumbing, roofing, walls and finishes, floors and finishes, building exterior, superstructure, doors and partitions, foundations, basements, elevators and cranes. Results of the inspections are reviewed by an Architectural Engineer using software from R.S. Means to tabulate and calculate costs of repairs, maintenance and improvements per system. The

grand total of deferred maintenance for the current fiscal year and the projected maintenance requirements for the next ten years are then calculated. The dollar amounts per building are then entered into the FIMS database and into the Ten-Year Plan.
The square footage total of PPPL buildings is approximately 725,000 square feet. The Buildings selected for inspection in FY04 were the Lyman Spitzer Building (111,943 sq. ft.), the Lab Building (31,474 sq. ft.), the Lab Wing (4,114 sq. ft.), the Engineering Building (19,086 sq. ft.), and the D-Site Cooling Tower (4,600 sq. ft.). The total area inspected in FY04 was 171,217 sq. ft. or 24% of the PPPL total building area of 725,000 sq. ft. The next annual inspections will be completed in the October 2005 timeframe. They will cover a new 20% of the facilities and the resulting data will be entered into FIMS at that time.

C. Facilities Management, Space Management & Utilization

The Maintenance and Operations Division of the ES&H and Infrastructure Department has the lead responsibility for the majority of infrastructure maintenance performed at the Laboratory. In addition, the AC Power Group of the Engineering and Technical Infrastructure Department provides supplemental infrastructure maintenance on high voltage electrical infrastructure systems. The Heads of the ES&H and Infrastructure Department and the Engineering and Technical Infrastructure Department report to the Director of the Laboratory.

The Maintenance and Operations Division is responsible for the following:

- Designing and constructing new structures, modifying existing structures, and coordinating significant site improvements.
- Engineering and planning of maintenance and operations for existing conventional facilities.
- Maintaining, operating, inspecting, and repairing existing conventional facility systems and experimental support systems.
- Managing the site-wide efficient use of energy (electric/gas) and utility (water/sewer) services.
- Coordinating work space planning efforts.
- Providing housekeeping, grounds maintenance (snow removal and landscaping), trash removal, recycling, and material handling services to the Laboratory staff.
- Maintaining, operating, repairing and modifying security and fire detection, suppression and reporting systems.
- Providing support and service for telecommunications systems, local and long distance equipment and lines, voice mail, billing, calling cards, cellular phones, pagers, 2-way radio systems, and home data lines.

The AC Power Branch of the Electrical Engineering Division is responsible for the following:

- Designing and constructing new structures, modifying existing structures, and coordinating significant high voltage electrical system improvements.
- Engineering and planning of maintenance and operations for existing high voltage electrical system infrastructure.
- Maintaining, operating, inspecting, and repairing existing high voltage electrical system

infrastructure.

PPPL Departments and Projects are not charged for space utilization. The Maintenance and Operations Division, line managers and Facility Managers throughout the organization are responsible for facilities management, space management and utilization. The overall PPPL Asset Utilization Index (AUI) is .977. The AUI for each of the PPPL facilities is listed in Attachment 2.

D. Land Use Planning

The Department of Energy and The Trustees of Princeton University have entered into a Lease Agreement covering the PPPL "C" and "D" Sites. The contract provides for an ultimate build-out potential of approximately 900,000 square feet – roughly 150,000 square feet more than currently exists. The lease contains certain restrictions such as building height, facility uses and site design criteria, and requires PPPL to comply with applicable DOE directives contained in Appendix I of the prime contract. The lease has recently been amended to incorporate a section of the access roadway serving PPPL. The added land provides a security buffer that ensures that all vehicles, and passengers, pedestrians, bicyclists, and others entering the access roadway are employees, contractors, subcontractors, agents, licensees, invitees, authorized personnel, representatives, scheduled deliveries, or necessary equipment for PPPL or DOE. The lease also includes an easement provision to DOE for access and maintenance of the canal water line that crosses Forrestal Campus and runs to Delaware and Raritan Canal.

Land-Use issues at PPPL are addressed through the National Environmental Protection Act (NEPA) Program as defined in Laboratory procedure ESH-014 "NEPA Review System". It is PPPL's policy to comply with the policies of the Department of Energy (DOE) and to conduct operations in compliance with the letter and spirit of applicable environmental statutes, regulations, and standards. It is also the policy of PPPL that efforts to meet environmental obligations be carried out consistently across all operations and among all organizations and programs at PPPL facilities. Protection of the environment and the public is a responsibility of paramount importance to our facilities. PPPL is committed to ensuring incorporation of all DOE Departmental and National environmental protection goals in the daily conduct of its business. PPPL has an equal commitment to advance the goals of restoring and enhancing environmental quality and ensuring public health.

Environmental Restoration Program
This activity supports the PPPL technical personnel and program management for all environmental restoration activities at PPPL. These personnel are responsible for the technical, financial, regulatory, and administrative issues related to soil and ground water remediation. In addition to the environmental restoration program outlined below, these personnel are also responsible for cleanup actions conducted in response to spills or other environmental impacts.

Under EM-40, the Environmental Restoration Program completed a comprehensive site-wide remedial investigation (RI) and remedial actions (RA) to address soil and ground water

contamination present at the facility. This aggressive remedial strategy identified sites or operable units that could be quickly and easily remediated or stabilized to meet regulatory requirements. The purpose of this strategy is to address significant remedial measures rapidly and to move a site into monitoring as quickly as feasible, thus reducing DOE's long-term environmental mortgage. All environmental restoration work is overseen by the New Jersey Department of Environmental Protection (NJDEP), as required by a Memorandum of Understanding (MOU) between NJDEP and Princeton University.

All identified Areas of Concern with soil contamination have been remediated to below the applicable NJDEP Soil Cleanup Criteria. Ground water beneath the site is contaminated with chlorinated volatile organic compounds (VOCs), primarily tetrachloroethylene (PCE), trichloroethylene (TCE) and 1,1,1-trichloroethane (TCA) at levels above the New Jersey Ground Water Quality Standards. Contaminated ground water is contained and captured by PPPL's foundation drainage system (primarily the D-site building complex), which discharges to the on-site detention basin.

Contaminated ground water is not migrating off-site. In addition to the ground water containment and extraction system created by the foundation drains, natural processes are degrading contaminants into less toxic by-products. Based on these findings, PPPL proposed a remedy that relies on the foundation drainage system to contain and extract contaminants and natural attenuation processes to degrade contaminants over time. A Remedial Action Work Plan (RAWP), outlining the procedures that used to monitor ground water conditions and ensure continued function of the foundation drainage system, was prepared and submitted to NJDEP in May 2000 and has been approved by NJDEP.

The final regulatory submittal, application for an Aquifer Classification Exception Area (CEA) designation was made to NJDEP in January 2002. NJDEP approved the CEA application in February 2002. PPPL now conducts quarterly ground water monitoring necessary to document containment by the foundation drainage system and degradation of contaminants. Long-term groundwater monitoring is expected to continue for up to 25 years, until contaminants have degraded to below regulatory levels. Budget estimates are based upon a relatively stable program that uses FY2000 costs as a planning base.

E. Site and Facility Planning

Site and facility planning is considered an essential activity in support of PPPL research and experimental programs. Planning assumptions rely heavily on the reclamation and re-use of existing laboratory spaces, although there still exists build-out potential for new facilities on C or D-Sites. The rationale upon which PPPL's maintenance and construction plans are based derive from a generalized analysis of the site's existing conditions and what is required to support the following scientific programs.

(1) Concept Innovation

In the coming decade, there will be continuing support for the theoretical and small-scale experimental research needed to do basic scientific studies and initiate new concepts as well as facilitate graduate student training.

(2) NSTX

The National Spherical Torus Experiment (NSTX) began operations in 1999 and will operate at PPPL for approximately another ten years. NSTX will test the spherical torus concept. This facility enables a test of the underlying scientific questions, which would then enable the design of a relatively inexpensive fusion system to achieve high levels of fusion power in a compact size.

(3) NCSX

PPPL is proceeding with construction of a second "proof-of-principle" experiment, the National Compact Stellarator Experiment (NCSX). This device will test the quasi-axisymmetric stellarator concept, which combines the high degree of symmetry of the tokamak with the steady-state properties of the stellarator. As with NSTX, it is possible to implement a cost-effective experimental test of this concept using existing site credits.

(4) Non-Fusion Applications

PPPL staff will continue to develop plasma science and technology for non-fusion applications, such as plasma science, materials science, chemical processing, and solar physics.

(5) ITER Support

PPPL and ORNL are partnered to host the U.S. ITER Project Office at PPPL. Once a location for the ITER site has been decided, PPPL's involvement in ITER support activities is expected to grow in depth and breadth.

(6) NSST

During the later part of the ten-year period for this site plan, design of a new spherical torus experiment is planned. This device may be located in the TFTR Test Cell.

The site's facilities must also accommodate the on-going PPPL mission, and the long-range physics goals of the U.S. Department of Energy. Moreover, design and development criteria for C and D-Sites shall be in accordance with applicable provisions of the Department of Energy/Princeton University lease of the land and requirements of applicable DOE Orders. Long-range planning to support the DOE-University 40-year lease/investment in PPPL is based on the following assumptions regarding the site infrastructure:

- Fundamental site land uses will not measurably change from those represented today. The internal operating relationships of site functions may adjust or be altered to meet Laboratory missions and needs.
- The Laboratory staff size has decreased substantially from 1995 levels, but has remained relatively level since. However, the level might be reduced somewhat in FY06 from the current 437 FTEs (including term employees and subcontractors) to approximately 410 FTEs. .
- A sequential rehabilitation effort will extend the useful life of aging facilities to the maximum feasible extent. Newer facilities will be altered consistently with changing missions and experimental needs.
- The basic infrastructure of underground utilities will not change in the long-range future. An important focus over the next ten years will continue to be refurbishment (life extension) or replacement of sections of the utility system, especially in instances where there may be an increasing trend of failures.

- A sequential program of roadway rehabilitation will be coordinated over time. Nearly forty years of vehicle use and seasonal change have taken their toll on the roadways. A logical sequence of improvement will restore them. The on-site vehicular circulation pattern will remain essentially the same. Future site vehicular access will depend on projected Route 1 corridor traffic volume and access alternatives planned in coordination with development of the Forrestal Campus. PPPL is subject to and shall comply with the provisions of the "New Jersey Traffic Congestion and Air Pollution Control Act," a 1992 NJ Statute.
- The environment will be protected by continued implementation of the Spill Prevention Control and Countermeasure (SPCC) Plan, the tasks identified in various environmental surveys and appraisals, performance of environmental evaluations of ongoing and proposed new activities in compliance with the National Environmental Policy Act (NEPA), and any other measures as may be mandated by the State or Federal governments.
- Institutionalized safety practices will continue to be implemented in accordance with the Integrated Safety Management (ISM) Description.
- Security considerations will be strengthened relative to the nature of on-site experimentation, Government directive, or circumstantial necessity.

F. General Plant Projects (GPP)

PPPL's GPP budget was $1.643 million in FY05 and is expected to be $1.810 million in FY06. For planning purposes, an assumption of a substantial GPP funding increase was used beginning in FY08, in order to show what funds would be necessary to reduce the lengthy and growing backlog of GPP jobs. Ideally, the combination of GPP and GPE funding would total approximately 1% of Replacement Plant Value. This would allow for sustainment of the existing infrastructure without an increase in project backlog. The following list provides an example of some of the projects that have been or will be completed during FY2004 and 2005:

- Interconnection of the D-Site Cooling Tower to C-Site Cooling Tower
- Upgrade and Repairs of the Elevated Water Tower
- Upgrade of the Site Access Control and Monitoring System
- Replacement of the roofing systems for the Lab, COB and CS Buildings.
- Upgrade of the D-Site Fire Alarm System (Phase 4 - Experimental Area Basement)
- Installation of the new Vehicle Barrier Security System
- Upgrade of the Lab, MG and CS Building Elevators
- Upgrade of the Underground Utility Building Connections
- Upgrade of the RF Building Fire Alarm System
- Upgrade of the CS Building High-bay Roofing Support System Upgrade
- Upgrade of CS Building Shielding Walls
- Replace RESA Crane Controls
- Replace C-Site Diesel Generator

In addition, the following projects are scheduled for work during FY06:

- Upgrade CS Building High Bay Crane
- Upgrade CS Control Room HVAC
- Seal RF, CS & MG Buildings
- Upgrade CS Building HVAC
- Upgrade CS Control Room Ceiling, Lighting, and Electrical Systems
- CS Test Cell Nitrogen Exhaust Ventilation System
- CS Test Cell Fire Suppression System
- C-Site MG Building Neutral Beam Rectifier Enclosure HVAC
- Upgrade Administration/Theory Roofing

Several projects have been added to the GPP list. The following projects are among the newest to be ranked by priority using the CAMP process and will now compete for funding. [The comprehensive list of GPP projects is contained in the Integrated Facilities and Infrastructure Crosscut Budget - Attachment 5.]

- Additional Procurement Offices
- Consolidation of Waste Management Operations
- Modernize Lab Wing Utility Services
- Relocate HP CASL Operations to RF Building
- Upgrade Administration/Theory Roofing
- Upgrade Cafeteria/Administration Wing Roofing
- C-Site HVAC Systems Upgrade
- D-Site HVAC Systems Upgrade
- New Cooling Tower
- Upgrade VQT1 Transformer
- Lab Wing Electrical Systems Upgrade

G. Recapitalization

The *recapitalization rate* is the number of years it would take to regenerate the physical facilities, either through replacement or major renovation. The numerator of the formula is the plant replacement value of facilities that are intended for recapitalization (RPV). It represents assets that have a continuing mission (i.e., facilities that will not be disposed of and so will need to be replaced or renovated at some point). The denominator includes the annual recapitalization investment.

The Science Laboratory Infrastructure (SLI) Program represented an initiative by DOE to improve the condition of the DOE Laboratory infrastructure. During the first several years, there was emphasis on using this funding for the retirement or excessing of facilities. PPPL received approximately $1.0M of SLI funding in FY04. With the discontinuation of SLI funding, plans for modernization of the PPPL infrastructure, which originated in 2002 have been deferred indefinitely. The current capital reinvestment strategy is focused on maintaining the reliability and availability of the existing infrastructure. Recapitalization of the existing infrastructure is accomplished solely through funding from the General Plant Project Budget. Recent examples include the renovation of inactive areas of the RF Building. The areas will be used by Science

Education and the HP CASL operations, which are being relocated. It is important to note that the GPP program is dynamic in nature – new projects continue to be identified on a real-time basis. Attachment 5 illustrates a proposed Project plan, however, the actual project work plan is decided upon at the beginning of each fiscal year, depending upon priorities and resources existing at that time. Restoration of SLI funding is critical to the modernization of Laboratory facilities [see Section VII.B. for further discussion.

H. General Purpose Equipment (GPE)

There will be need to supplement General Purpose Equipment (GPE) in order to provide replacements for existing equipment that will approach or exceed its design life. Much of the GPE funding plan focuses on replacing existing mechanical and electrical components that are approaching the end of their design life.

Other GPE procurements that are proposed include the following:

- Replacement of the #2 boiler (circa 1959) and the north hot well tank.
- Replacement of the C-101 and 701 air compressors.
- Replacement of Water System Pumps.
- Purchase of seven uninterruptible power units for emergency lighting.
- Replacement of obsolete secondary switchgear on Unit Substations 1 and 2 in room 104 on the first floor of the L-Wing.
- Replacement of obsolete secondary switchgear on Unit Substation 4 in the LSB East-Wing.
- Replace Hot Water Heat Exchanger for Cafeteria and the RF building 4th floor.
- Replace Boiler #3.
- Replace Sanitary Sewer Lift Stations for the ESU building, Module 6 and D-Site.

I. Leasing

At this time, PPPL does not lease any space.

J. Disposition

The C-Site Cooling Tower was demolished in 2004 as part of a long-term plan to consolidate personnel and functions, and reduce reliance on high maintenance temporary facilities. The D-Site Tritium Module will be demolished in 2005. The C-Site Pump House is also being considered for demolition. The HP CASL will be demolished after relocation to the RF building, which is being renovated as part of a GPP project. These efforts have been part of a long-term

plan since the mid-1990's to consolidate personnel and functions, and hence reduce reliance on high maintenance temporary facilities.

K. Value Engineering

Value engineering for small projects (i.e., less than $5 million) is applied via the design process and independent cost estimating provided by Architect/Engineer firms. Larger projects (i.e., $5 million and more) undergo a more thorough value engineering process. Formal design reviews utilize independent reviews involving visiting scientists, engineers, and project control personnel. They are also subject to DOE project reviews (i.e., "Lehman reviews") along with earned value reporting throughout the project life-cycle.

L. Mission Critical Facilities

Nearly all PPPL facilities are currently categorized as "Mission Critical" in that they are considered "critical to mission accomplishment and, if not available, would adversely impact the mission." The exceptions are primarily buildings that will be demolished, such as the Tritium Support Facility Module. Pending further guidance regarding the definition and use of the new FIMS field that has been established for identifying facilities that are "Mission Critical", "Mission Dependent, Not Critical" and "Not Mission Dependent", the use of this field will be refined. Necessary updates will be entered into the FIMS database and the information will be used to allocate resources.

M. Five-year Sustainment Requirements

Each year, in the September-October time-frame, maintenance needs and improvements are re-evaluated for 20% of PPPL facilities by physical inspection. The master list of deferred and future maintenance needs is updated with the new information resulting from the inspections. The other buildings, which were not inspected during the year, are also reviewed and updated without the benefit of a full inspection. Based on funding availability of 2% per year for maintenance, the most pressing maintenance is scheduled for an initial five years of the planning cycle.

N. Maintenance Program for Nuclear Facilities [NA]

Upon the successful decommissioning of the TFTR project, PPPL no longer has facilities that fall under the DOE Order 433.1, Maintenance Program for Nuclear Facilities.

O. Management of Deferred Maintenance (DM)

Buildings and infrastructure are inspected thoroughly at least once each five years. The deferred maintenance for those facilities are determined and entered into the FIMS database. The Maintenance and Operations Division and the AC Power Branch use the information to update their respective in-house maintenance databases and plan for near term and long-range maintenance requirements. The planning includes prioritizing the maintenance queue using risk-based decision making that considers maintenance history, asset life cycles, ES&H impacts, programmatic impacts, costs and workforce levels and schedules. Until the last few years, the deferred maintenance backlog had continued to grow. Aging facilities, reduced staffing and reduced maintenance budgets made it difficult to reduce the backlog. Some modest reductions in the deferred maintenance backlog were realized in FY 2003 and FY 2004. The reductions are in part due to the ongoing efforts to dispose of high maintenance modular and outlying buildings, to centralize staff and activities, and to provide adequate maintenance of those centralized facilities. Also helping to decrease the DM backlog somewhat is a new computerized maintenance management system that was purchased and installed in early FY2003. The new system allows for the more efficient prioritization, assignment and scheduling of maintenance tasks. Further decreases in the deferred maintenance backlog are expected over the next several years as the recent trend continues and as funding for deferred maintenance increases. The deferred maintenance trend is shown below and in Attachment 3.

DM 2002	$11,773,870
DM 2003	$11,748,755
DM 2004	$11,059,666
DM 2005 (estimate)	$10,560,000
DM 2006 (estimate)	$10,060,000
DM 2007 (estimate)	$9,860,000
DM 2008 (estimate)	$9,560,000

The GPP project table (Section 2.2 of Attachment 5) lists projects that are part of the DM backlog. The projects are ranked according to PPPL's mission risk and the probability of occurrence prioritization tool (e.g., the Capital Asset Management Process [CAMP] prioritization approach that considers 1. the potential for DM actions to reduce the likelihood and severity of mission interruptions and 2). the importance of facility activities to site mission objectives.) The highest priority GPP projects are scheduled to receive funding or be placed at the top of the queue for funding in future years.

In addition the GPP funding of projects listed in Section 2.2 of Attachment 5, there is potential for additional funding specifically to reduce deferred maintenance. DOE-SC has requested $3M of GPP funds in the FY 2006 SLI budget to help address the SC DM backlog of $573M. The SC plan is to grow this funding to approximately $69M (1% of SC RPV) by FY 2010.

Per DOE-SC guidance, the PPPL share of the DM Reduction funding is calculated[5] to be approximately 1.5% of the SC total. This additional funding will be helpful, however the

5 The 1.5% PPPL share is calculated by dividing (PPPL's Deferred Maintenance [DM] + Rehabilitation and

proposed method of apportioning the funds among Laboratories will result in less funding for PPPL than is necessary. Alternative algorithms for allocating these funds should be considered. For example, allocating the funds as a percentage of DOE-SC's overall funding of the Laboratories, would be more equitable and would allow the PPPL deferred maintenance backlog to be reduced at a much more desirable pace. The annual funding that PPPL anticipates receiving from this new program, using a 1.5% share, is as follows:

FY06- $ 45k of $3M available to all SC
FY07- $300k of $20M available
FY08- $540k of $36M available
FY09- $787.5k of $52.5M available
FY10- $1,035k of $69M available

The $45k of funding in FY06 would be used towards replacement of the LSB East-wing Addition Dry Cooler Cooling Tower. Funding for FY07 through FY10 would be used to accomplish the highest priority GPP projects that are currently in the queue (listed in Section 2.2 of Attachment 5). Other projects being considered for out-years include replacement of the existing cooling tower pumps (#'s 803, 804, 805 and 806) and construction of a new cooling tower to replace the aging D-Site Cooling Tower that would be necessary to provide capacity during NCSX operations.

PPPL has a total of four buildings that have an ACI categorization of "Poor" or "Fail". "Poor" means that the deferred maintenance as a percentage of RPV is from 25% to less than 60%. If deferred maintenance divided by RPV is greater than 60%, the building receives a "Fail" rating. The PPPL buildings with a FIMS rating of "Poor" are as follows:

- Hazardous Material Storage Building (C93) 2,100 G.S.F.
  Studies into consolidating operations from the Hazardous Waste Storage Building into the relatively new Radioactive Waste Building are being investigated. This would allow the demolition of the Hazardous Waste Storage Building and more efficient and centralized services, which are all provided by the Materiel and Environmental Services Division.

- CAS Building (C91) 15,000 G.S.F.
  The CAS Building deferred maintenance includes a new roof, HVAC replacement, piping insulation, lighting, gutters and down spouts. The roof replacement is on the PPPL list of GPP jobs competing for funding based on priority ranking.

- Theory Wing (C23) 5,267 G.S.F.
  The Theory Wing, along with the Administration Wing and Module VI, are facilities with high maintenance costs that would be demolished upon completion of the West Wing Addition. The West Wing Addition to the LSB Building is a proposed project to replace these building and reduce costs and the building footprint. Should the West Wing Addition not be funded, additional funds would have to be expended on the existing buildings to restore them to adequate conditions.

Improvement Costs [RIC]) by (All SC's DM + RIC). This is [($11,059,666+ $6.2M) / ($1155M)], or 1.5%.

As of April 2005, the only building that falls into the "Fail" category is the Off-Site Canal Pump house (Building P), which is 700 G.S.F. The Canal Pump house will be repaired as necessary. Pump replacement is tentatively scheduled in FY07.

Two buildings were removed from the Fail category since the issuance of the FY2004 TYSP. The C-Site Cooling Tower and Pump house [Building C60, 1460 G.S.F.] was demolished and removed in August 2004 and the pump house is being considered for demolition. The Tritium Support Facility Module [Building D33, 900 G.S.F.] is slated for demolition in FY05 using operating funds.

The total expected DM over the FY 2004 to FY 2011 period based on the management strategy, approach and funding discussed above is essentially covered by the GPP projects and budget listed in Attachment 5 and additional Deferred Maintenance Reduction funding anticipated by DOE-SC.

P. Performance Indicators and Measures

Performance measurement is a vital component of the PPPL management philosophy. Princeton University and the DOE have established a performance based contract for the operation of the Princeton Plasma Physics Laboratory. This contract, which is in effect through September 30, 2006, includes important facilities-related performance measures. PPPL and the DOE Princeton Site Office evaluate and re-establish the performance measures annually by mutual agreement. The current performance measures apply to fiscal year 2005 (October 2004 through September 2005) are included in Appendix B of the Prime Contract. Metrics for the performance expectations are reported on a quarterly basis.

The overall goal for Infrastructure and Maintenance as stated in the Contract is: "Be the steward of the government-owned real property assets entrusted to PPPL by ensuring that the research program and infrastructure needs are met to allow for continued laboratory operations in a safe, environmentally responsible, and cost effective manner."

The current agreed upon performance measures for FY2006 are summarized below.

Objective C-1: Projects shall be managed efficiently, completed on time, within budget, and meet baseline scope requirements. Uncosted carryovers are minimized.

Measure C-1.1: Completion of milestones, per approved Construction Directives and/or project baseline documentation, for the following types of projects:

- General Plant Project (GPP)
- In-House Energy Management (IHEM)
- Line Item Construction Projects
- Fabrication of Major Items of Capital Equipment
- New Strategic Laboratory Infrastructure Projects (SLI)

The measure is to be calculated by dividing the Number of Milestones Completed on Time by the Total Number of Milestones Scheduled for Completion. The milestones are determined jointly with DOE-PSO using Construction Directives and Project Baselines.
Measure C-1.2: Project Cost Compliance
The Cost Compliance is to be calculated by dividing the Sum of Budgeted Cost of Work Performed by the Sum of Actual Costs of Work Performed.

Objective C-2: Energy Use Reductions and Greenhouse Gas reductions show continuous improvement and are on target toward meeting the DOE energy efficiency leadership goals consistent with DOE O430.2A.

Measure C-2: Total building energy consumption declines consistent with planned site growth and operations. Reduce building energy consumption by 30% in FY2005 vs. FY1985 Baseline. (Ultimate goal is 35% reduction by 2010.)

Objective C-3: Resources are being effectively allocated to address ES&H, Programmatic, and Operational considerations based on a risk-based prioritization model.

Measure C-3: A process for allocating resources shall be implemented and a risk based prioritization plan shall be provided to DOE/PSO. The Plan shall include a realistic funding scenario for progressive elimination of risk.

Objective C-4: Maintenance of active conventional facilities against DOE corporate maintenance investment goals.

Measure C-4: Maintenance Investment Index (MII) defined as total contractor funded maintenance for active conventional facilities divided by replacement value of these facilities.

The measure is evaluated based on whether the MII is attained for the fiscal year. The PPPL interim goal is to achieve 1.7% by FY 2005. The ultimate goal is to achieve 2.0% by FY 2006

VI. Process for Development of the Plan

A. Prioritization Process

This TYSP covers a planning horizon of ten years (FY 2007 through FY 2016) and also includes data for FY 2005 and 2006. The TYSP describes the existing site and infrastructure of the Princeton Plasma Physics Laboratory (PPPL) in terms of how it supports current programs and what is needed to support programs planned for the future.

PPPL uses Procedure GEN-009 "GPP Prioritization" for assessing and prioritizing proposed GPP Projects. The Technical Resources Committee (TRC) is the final authority for establishing GPP Priorities and annual work plans and is composed of senior management representatives from technical, scientific, and administrative organizations within the Laboratory. The Maintenance & Operations Division serves as the focal point for collecting proposed projects. Proposed projects result from input from various organizations working at PPPL, but also as a result of facility assessments routinely performed by Maintenance & Operations. To facilitate the decision-making process, the TRC has formed a subcommittee, which is composed of subject matter experts from across the Laboratory to evaluate the merits of individual projects. This subcommittee uses criteria developed by the DOE for the Capital Asset Management Process (CAMP) to evaluate the proposed projects. It is important to note that the CAMP criteria is intended to be a tool for management to rank projects, but it is not intended to replace sound management judgment in reaching final decisions on project priorities. Prioritization results are shared with the DOE Princeton Site Office, which provides concurrence prior to authorizing work on any Project.

The CAMP prioritization process is a systematic, structured, and consistent method for determining the preferred order for allocating limited resources to solve problems. The process reflects the values of the Department of Energy and it includes two elements of risk -- consequence and probability. The process is universal encompassing four major categories: (1) health and safety, (2) environment/waste management, (3) safeguards and security, and (4) programmatic. These rating criteria were developed and positioned based upon Departmental intentions and public expectations, appropriate standard industrial practices and they represent the desired level of operational conduct. As mentioned previously, this process is used for the General Plant Project Program, but it has also been adapted and extended for use on a selected few operating expense projects, as well.

The facility assessments by the Maintenance and Operations Division also provide a basis for strategic decisions regarding future site development. For example, facility assessments of several aging C-Site Buildings have led to the initiation of a conceptual design to study the benefits of erecting a single, new 3-story building and therefore eliminating 3 separate single-story buildings. The benefits include reduced operating expenses, a reduction in total building space, improved human factor considerations, and avoided costs for rehabilitating the older buildings. The conceptual design is scheduled to be completed in order to coincide with the FY07 budget planning cycle.

Maintenance priorities are established on a fundamental basis that relies heavily on the knowledge and experience of in-house engineers and technicians. Typically, 3000 to 3500 work orders are completed in a given fiscal year. Priorities are established to address work tasks that: (a) affect environment, safety, health or security issues; (b) are directly related to facility operations; (c) require immediate action to restore equipment to operable status; and (d) provide preventive maintenance to operate the facilities in an efficient manner.

B. FIMS

The Facility Information Management System (FIMS) is a web-based database designed to track real property information for the Department of Energy (DOE). PPPL has responsibility to maintain the data in the database pertaining to PPPL buildings and other structures as accurately and reliably as possible.

The responsibility for FIMS at PPPL resides jointly in the Maintenance & Operations Division (M&O) and Accounting Division. The M&O Division has primary responsibility for physical inspection of real property and determines specifications, present condition and utilization status. In addition, the M&O Division determines real property values (RPV) and maintenance costs (deferred, actual and required) and enters these values in FIMS. Staff of the Accounting Division perform actual data entry of other information. Employees responsible for data collection and data input in both the Accounting and M&O divisions participate in DOE sponsored FIMS training as deemed appropriate.

PPPL staff make every effort to accurately measure, assess or otherwise determine the information required in FIMS. The Accounting and Maintenance & Operations Divisions work together to ensure that data is accurate and up-to-date. Accounting will automatically update records based on information contained in final cost reports approved by the DOE Princeton Site Office for projects which: a) have modified a facility or structure contained in the database; or b) should be added to the database. The DOE-PSO approval indicates which FIMS record to update. Once per year, a representative sample of approximately 10% of the buildings and structures in the database is randomly audited by Accounting and the DOE site office.

Designated staff of the Maintenance & Operations Division collect FIMS data through physical inspection of the property or from other reliable sources. Information regarding the condition of facilities and structures observed during routine inspections and in the performance of maintenance and repairs to real property is documented. Approximately 20% of PPPL real property is inspected annually by personnel from the Maintenance & Operations Division and the Power Engineering Branch, and the results are documented in a detailed listing of deferred maintenance tasks by building and OSF. The Division Heads for Accounting and M&O are responsible to report any major changes in the data reported in FIMS to the DOE-Princeton Site Office. They must also report any change to the overall site's real property value that is greater than 5% and provide an explanation.

The sitewide Conventional Replacement Plant Value (RPV) at PPPL in October 2004 for Buildings and OSFs totaled $252,409,708. There are two structures at PPPL coded in FIMS as Shutdown Pending Disposal: the C-Site Cooling Tower/Pumphouse (FIMS Record #C60) and the D-Site Tritium Support Facility (FIMS Record #D33). The C-Site Cooling Tower was removed in 2004, and only the Pumphouse remains. The Tritium Support Facility is a modular structure. Approval has been received for removal of these two structures, and removal will be completed when resources are available. A request to remove or demolish a third facility, the HP Calibration Laboratory (FIMS Record #C94) is nearly complete and will be submitted to DOE shortly.

VII. Resource Needs

A. Summary

A fundamental challenge to successful utilization of the sustainment and recapitalization concepts is its consistent application to the same set of facilities. Failure to achieve that linkage produces erroneous recapitalization rates, confusion, and justifiable concern about the reliability of the metric. For the purposes of this Ten Year Site Plan, PPPL's Infrastructure RPV is approximately $252,000,000, 75% of which is based primarily upon 725,000 sq. ft. of infrastructure buildings. The remaining 25% of the Facility RPV also includes replacement values for non-building infrastructure such as pipelines, electrical distribution systems and other similar community assets.

The result of the planning and analysis process is summarized in the Resource Needs Summary that includes line item construction, General Plant Projects (GPP), General Purpose Equipment (GPE), real property maintenance and operating funding for site clean-up activities.

A summary of the resource needs for this TYSP is shown below in Table 1. A compilation of the projects that make up the GPE and GPP funding line is included in Attachments 4 and 5.

Table 1
Resource Needs for Achieving SC Vision for 21st Century Labs
Princeton Plasma Physics Laboratory

Project/Activity	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16
Real Property Maintenance ($M)	4.3	5.2	5.3	5.4	5.6	5.7	5.9	6.0	6.2	6.4	6.6	6.8
Maintenance (as % of RPV)	1.7	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
GPP ($M)	1.643	1.81	1.81	2.3	2.5	2.8	2.875	2.961	3.05	3.142	3.236	3.333
GPE ($M)	0.12	0.11	0.42	0.44	0.54	0.56	0.57	0.59	0.60	0.62	0.64	0.79
Line Item Construction ($M)				8.0			6.9					
Science Laboratory Infrastructure ($M)	*	*	*	*	*	*	*	*	*	*	*	*
DOE-SC Deferred Maintenance Reduction Funding		.045	.300	.540	.788	1.035	1.1	1.135	1.167	1.202	1.238	1.275

* The status of SLI funding is indeterminate for FY05 and beyond.

B. Plan for Modernization

The average age of PPPL buildings weighted by square footage is 31.6 years. During the period of 1994 through 2002, extensive efforts and resources were devoted to replacing roofing systems that had begun to show signs of advanced deterioration. That effort is expected to continue for several more years, albeit at a much reduced level. In general, the building structures are in fair to good condition. Some resources will be needed toward the end of the coming decade to rehabilitate the nine buildings that are currently 44 years old in order to extend their life and increase their versatility for new scopes of work undertaken by the DOE at PPPL. The strategy for rehabilitation and modernization of these core buildings is to approach it in a phased manner over the latter half of the decade by setting aside a certain funding level based upon building function and size. As referred to in Section V.G of this Plan, modernization of the Laboratory is a resource intensive endeavor. The use of Science Laboratory Infrastructure (SLI) funding had been viewed as the principle mechanism for achieving a modernization goal. With the discontinuation of SLI funding, plans for modernization of the PPPL infrastructure, which originated in 2002 have been deferred indefinitely. In the event that SLI funding is reinstated, a list of targeted projects is illustrated in Attachment 4.

C. Operating Funding

Beginning in FY2000, DOE established a benchmark provided by the Federal Facilities Council, which recommended a goal of at least 1.5% of the RPV of active, non-scientific facilities for routine maintenance, repairs and replacements. At the time, each site was encouraged to identify the appropriate goal for their site taking the local situation into account. Recently, DOE has increased that goal to 2% of the RPV. Due to adverse impacts on programmatic activities, PPPL received concurrence from the Director of Science to establish 1.7% as a target for FY05 and 2.0% as a target for FY06 (and thereafter).

D. Line Item Construction Projects

The work plan laid out in this Strategic Facilities Plan includes two projects that exceeded $5M.

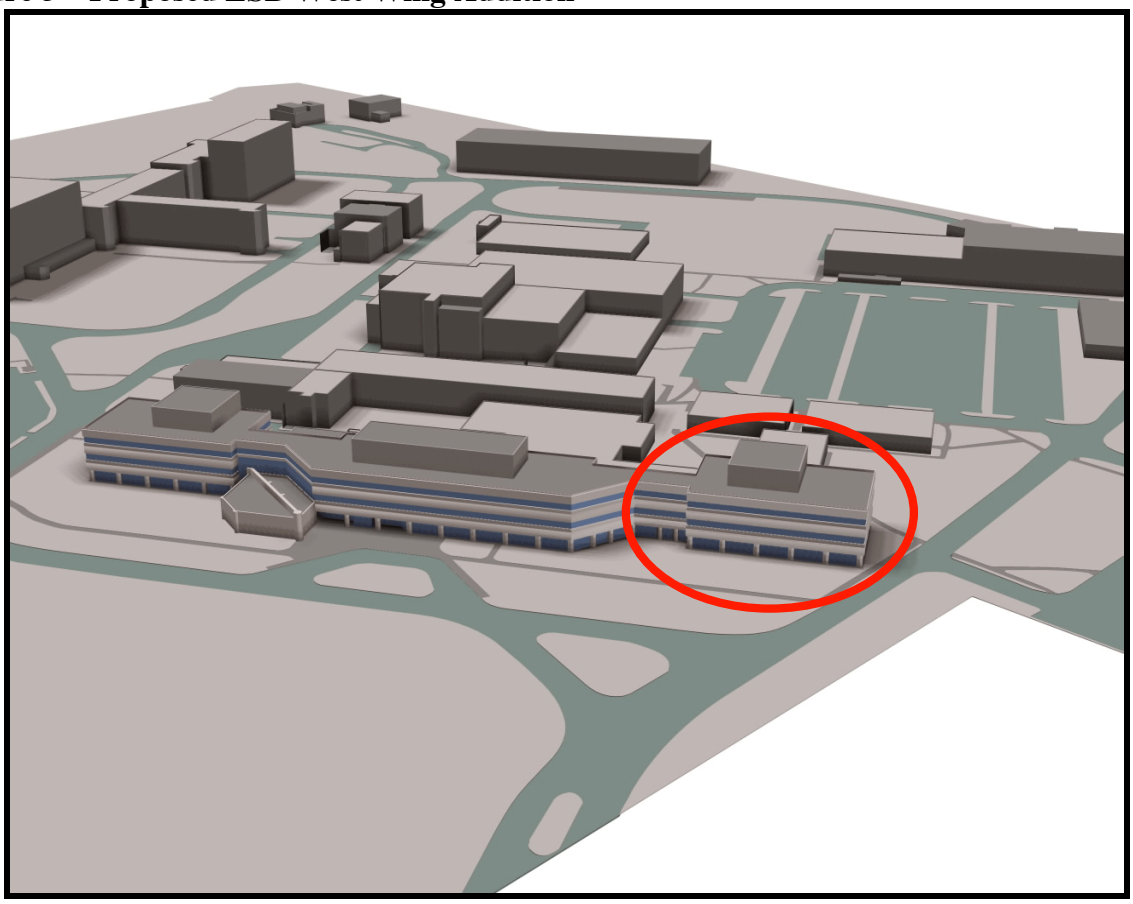
West Wing Addition
The "West Wing Addition" is a conceptual project that will add approximately 37,000 sq. ft. of office space adjacent to the existing LSB. The additional building will replace 3 existing structures (one that is over forty years old, one that is over 30 years old and one modular facility), which will be demolished once the new building is commissioned. The approximate cost of this project (office complex only) is $8.0M. The rationale for pursuing this concept is based upon the following objectives:

- reduce the number of building assets in the PPPL inventory;
- reduce building area requiring operating and maintenance expenditures;
- reduce deferred maintenance liabilities; and
- improve energy efficiency.

As part of the development of the conceptual design, the benefits of this proposed project will be quantified in greater detail.

This project has been included as a Line Item proposal within the TYSP. In the event that Line Item funding is not forthcoming, an alternative is to pursue construction of a smaller addition with a project cost that is below the maximum $5M GPP limit.

Figure 5 – Proposed LSB West Wing Addition



Architectural rendering of the Lyman Spitzer Building (LSB)
highlighting the proposed "West Wing Addition"

MG, CS and RF Buildings Wall Replacement

Replacement of exterior walls is required for three major buildings on C-Site. The MG, CS and RF Buildings are constructed with 69,870 sq. ft. of transite wall panels. The panels have a very low insulation R-factor (.375) and transite is manufactured from cement that contains asbestos fibers. The 45+ year old panels are showing signs of wear and delamination and they could present a health and environmental hazard if the asbestos fibers become friable. The MG, CS and RF Buildings comprise over 128,000 sq. ft. of floor space that will be utilized more over coming years due to commencement of NCSX activities and relocation of other activities such as Science Education, and Health Physics operations. Replacement of the transite panels with

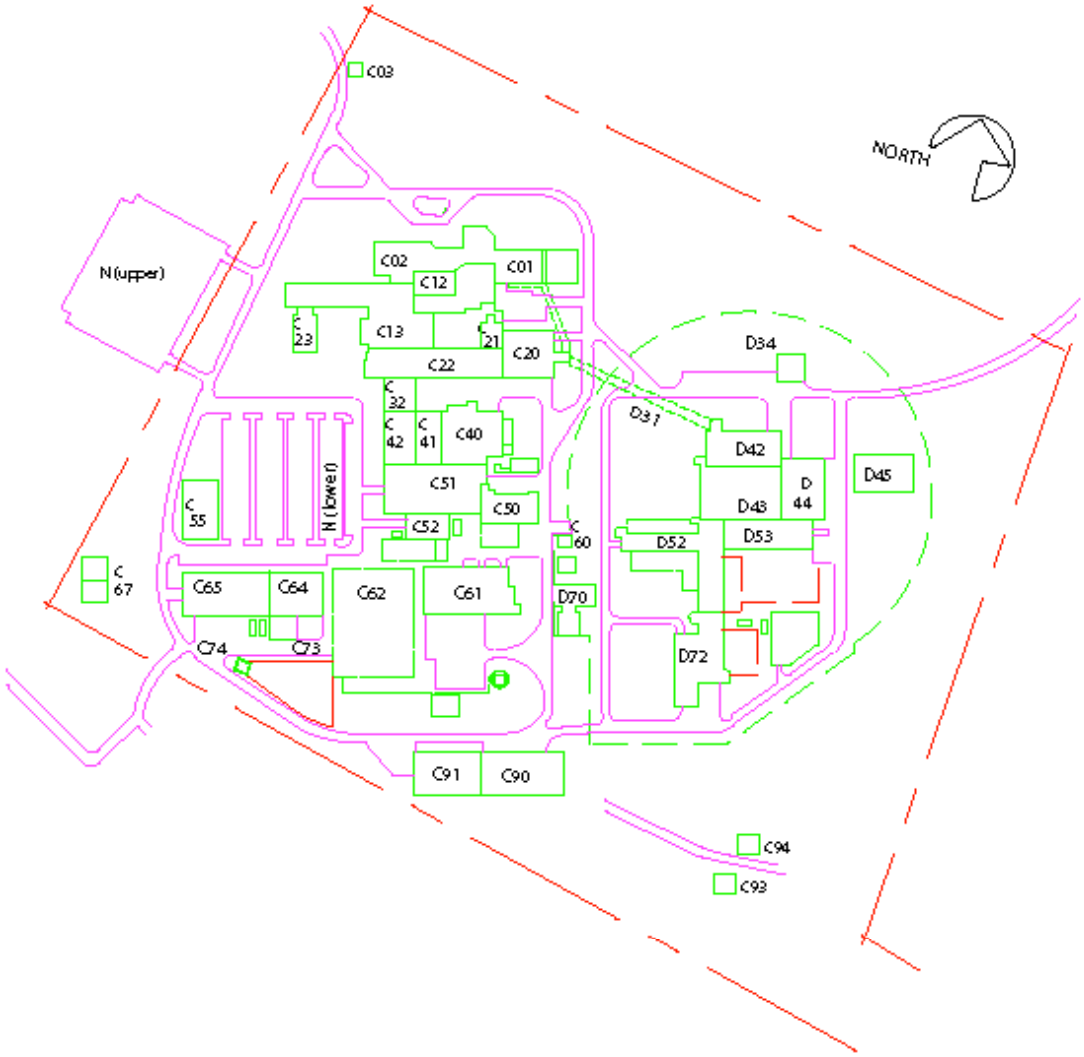
adequately insulated, weather-tight materials is crucial to the modernization and sustainment of these buildings. Replacement of windows with modern energy efficient units is also a part of this project. Energy costs to heat and cool the buildings will be significantly reduced, the integrity of the building exoskeletons will be restored and aesthetics will be much improved. The project will dramatically improve the condition and usability of the three core buildings.

The approximate cost of this project is $6.9M. When renovated, the building will be key to the long-term strategies of space consolidation and energy efficiency. The relocation of the fabrication and machine shop operations from the CAS/RESA buildings to the MG building is just one of the possibilities that could then be pursued. This would allow the decommissioning of the CAS/RESA buildings, which consist of over 22,000 sq. ft. of space, and associated maintenance, energy and operation efficiency savings.

Attachments

1. C and D-Site Buildings
2. Listing of Buildings, Conditions, Square Feet and Utilization
3. Summary Overview of SC Facilities at PPPL
4. Proposed SLI Modernization Projects and GPE Tentative Funding Profile
5. IFI Crosscut Budget
6. Acronyms

Attachment 1 C and D-Site Buildings



C-SITE

C01 LSB East Wing
C02 LSB West Wing
C03 LSB Guard Booth
C12 Cafeteria/Admin Wing
C13 Administration Building-GPCC/Library
C20 Engineering Wing
C21 L Wing Addition
C22 Laboratory Building
C23 Theory Wing
C32 Shop Building
C40 RF Building
C41 CS Building
C42 COB Building
C50 Systems Test Building (Exper. Pwr./ESAT)
C51 MG Building
C52 PLT Power Building
C55 Modular Building 6
C60 Cooling Tower Pump House
C61 Maintenance Building
C62 Switchyard
C64 Receiving #1
C65 Receiving #3
C67 Emergency Ser Bldg
C73 Material Control Support Facility
C74 Gas Cylinder Stor Bldg
C90 Research Equip Stor &Assy
C91 CAS Bldg
C93 Material Storage Bldg
C94 HP Cal Lab Mod 3

D-SITE

D31 TFTR-Control Room Tunnel
D33 Mod 7 Tritium Support Facility
D34 LEC Building
D35 Rad Waste Facility
D42 Mock-Up Building
D43 TFTR Test Cell
D44 Hot Cell & NB Test Cell
D52 FCPC Building
D53 NBPC Building
D70 TFTR Cooling Tower Pump House
D72 TFTR MG Building

Parking lots refered to as lettered

PRINCETON PLASMA PHYSICS LABORATORY
"C"-SITE & "D"-SITE
BUILDINGS

Attachment 2 Summary Overview of SC Facilities at PPPL

Verified April 2005	FIMS		Building					(=1-FCI)
Bldg Name	Bldg No.	Gross Sq. Ft.	FY05 RPV*	FY05 DM	FCI	RIC	AUI	ACI
LSB	C01	111,943	$15,491,361.91	$1,063,432.00	6.86%	$0	1.00	0.93
Guardbooth	C03	164	$258,883.89	$16,000.00	6.18%	$0	1.00	0.94
Admin Wing/Cafeteria	C12	9,721	$2,025,092.43	$492,000.00	24.30%	$0	1.00	0.76
Admin Bldg/Library/Computer Add.	C13	25,743	$3,686,416.91	$216,000.00	5.86%	$0	1.00	0.94
Engineering Wing	C20	19,086	$2,733,129.51	$173,281.00	6.34%	$0	1.00	0.94
L-Wing	C21	4,114	$1,445,927.30	$154,177.00	10.66%	$0	1.00	0.89
Lab Bldg	C22	31,474	$10,454,676.09	$653,896.00	6.25%	$0	1.00	0.94
Theory	C23	5,267	$754,238.35	$373,000.00	49.45%	$3,100,000	1.00	0.51
Shop Bldg	C32	17,390	$4,646,612.00	$840,000.00	18.08%	$0	1.00	0.82
RF Bldg	C40	41,404	$10,863,815.04	$750,000.00	6.90%	$0	1.00	0.93
CS Bldg	C41	27,025	$7,090,971.92	$480,000.00	6.77%	$0	1.00	0.93
COB Bldg	C42	9,223	$1,320,740.52	$318,000.00	24.08%	$0	1.00	0.76
System Test Bldg	C50	8,346	$2,189,870.55	$89,000.00	4.06%	$0	1.00	0.96
C-Site MG Bldg	C51	64,857	$17,017,545.45	$666,000.00	3.91%	$0	.80	0.96
PLT Power Bldg	C52	6,684	$560,682.26	$53,000.00	9.45%	$0	1.00	0.91
Mod 6 (ERWM)	C55	8,164	$1,169,090.92	$208,500.00	17.83%	$3,100,000	1.00	0.82
C-Site Tower/Pumphouse	C60	1,460	$30,000.00	$0.00	0.00%	$0	0.00	1.00
Facilities Bldg	C61	22,730	$6,073,461.23	$317,000.00	5.22%	$0	1.00	0.95
Warehouse Receiving 1	C64	13,083	$1,097,457.51	$102,000.00	9.29%	$0	1.00	0.91
Warehouse Receiving 3	C65	20,000	$1,677,684.80	$52,000.00	3.10%	$0	1.00	0.97
ESU Bldg	C67	7,694	$1,162,695.97	$50,000.00	4.30%	$0	1.00	0.96
Material Control Support Space	C73	2,351	$336,664.96	$2,100.00	0.62%	$0	1.00	0.99
Gas Cylinder Storage	C74	1,200	$100,661.09	$25,000.00	24.84%	$0	1.00	0.75
RESA Bldg	C90	20,750	$5,444,502.03	$495,000.00	9.09%	$0	1.00	0.91
CAS Bldg	C91	15,000	$1,258,263.60	$480,000.00	38.15%	$0	1.00	0.62
Hazmat Storage Bldg	C93	2,100	$176,156.90	$67,000.00	38.03%	$0	1.00	0.62
Mod 3 (HP Calibration Lab)	C94	2,170	$579,824.50	$85,000.00	14.66%	$0	1.00	0.85
Mod 7 (Tritium Supp Facility)	D33	900	$128,880.68	$0.00	0.00%	$0	0.00	1.00
LEC Building (Liquid Effluent Collect)	D34	4,550	$1,104,237.63	$45,000.00	4.08%	$0	1.00	0.96
Rad Waste Handling Facility	D35	5,600	$1,469,359.58	$0.00	0.00%	$0	1.00	1.00
Experimental Area	D42	92,136	$59,032,496.42	$670,000.00	1.13%	$0	1.00	0.99
FCPC	D52	33,997	$6,644,767.10	$205,000.00	3.09%	$0	1.00	0.97
NBPC	D53	43,680	$11,628,512.54	$140,000.00	1.20%	$0	1.00	0.99
D-Site Cooling Tower/Pumphouse	D70	4,600	$1,116,372.11	$65,680.00	5.88%	$0	1.00	0.94
D-Site MG Bldg	D72	39,760	$11,552,369.66	$210,000.00	1.82%	$0	1.00	0.98
Off-Site (Rt. 1) Canal Pumphouse	P1	700	$169,882.71	$137,000.00	80.64%	$0	1.00	0.19
			$192,493,306.07	$9,694,066.00				

AUI Range = 1.00 > 0.98 Excellent, 0.98 > 0.95 Good, 0.95 > 0.90 Adequate, 0.90 > 0.75 Fair and 0.75 > Poor

ACI Range = 1.00 > 0.98 Excellent, 0.98 > 0.95 Good, 0.95 > 0.90 Adequate, 0.90 > 0.75 Fair and 0.75 > Poor

Attachment 3 Summary Overview of SC Facilities at PPPL

Total Building Space (gross ft2)	725,066 gross ft^2
Buildings	36
Largest Occupied Building (gross ft2): Test Lab (Bldg #058)	LSB (C01/02) 111,943 gross ft^2
Trailers, number of:	2
Real Property	0
Personal Property	2
Wooden Buildings	0
Excess Facilities:	
Uncontaminated	2
Contaminated	0
Excess Building Space to be Removed in FY04	0
Replacement Plant Value (RPV): Total [excluding trailers]	$371,870,140
Programmatic (OSF 3000 category)	$117,437,306
Non-Programmatic (used for calculating Indices)	$252,409,708
Landlord Program	Office of Science
Age of Buildings: Average	31.6 years
% of space older than 40 years	36.5%
% of space 30 years or younger	59.9%
Maintenance Investment Index (MII) & Maintenance Funding	
FY 04	1.5% / $3,840,250
FY 05 (minimum of 2% or agreement from 2004 On-Sites)	1.7% / $4,290,965
FY 06 (minimum of 2% or agreement from 2004 On-Sites)	2.0% / $5,171,142
FY 07 (minimum of 2% or agreement from 2004 On-Sites)	2.0% / $5,300,421
Deferred Maintenance (DM) Trend **Doesn't include personal property trailers.*	
DM 2002	$11,773,870
DM 2003	$11,748,755
DM 2004	$11,059,666
DM 2005 (estimate of year-end DM)	$10,560,000
DM 2006 (estimate)	$10,060,000
DM 2007 (estimate)	$9,860,000
DM 2008 (estimate)	$9,560,000
Total Summary Condition (DM + RIC) *:	$17,259,666

Deferred Maintenance (DM)	$11,059,666
Rehab and Improvement Cost (RIC)	$ 6,200,000
Total Summary Condition Index (TSCI): (percent of Total RPV) *	6.84%
Facility Condition Index (FCI) (based on DM)	4.38%
Rehab & Improvement Cost Index (based on RIC)	2.46%
ACI (Asset Condition Index from RPAM Order) (1-FCI)	.956
AUI (Asset Utilization Index from RPAM Order)	.977
Leased assets:	0
Square footage: Total	NA
Office	NA
Other	NA
Annual Lease Costs:	NA

Attachment 4 - Proposed SLI Modernization Projects and GPE Tentative Funding Profile

Proposed SLI Modernization Projects (SLI)

Project Title	Estimated Cost
Admin Building	597,400
Library Building	460,410
Laboratory Building (Labs)	1,592,380
Laboratory Building (offices)	449,080
Shop Building	1,755,120
MG Building	3,272,310
CS Building	2,727,440
COB Building	931,120
Facilities Building	646,840
Warehouse/ Receiving #3	168,920
C-Site Standby Power Upgrades	2,060,000
RF Building	3,605,000
CAS/RESA Building (Assembly Areas)	515,000

GPE

Project Title	Est. Cost	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sump Pump Replacement	106.1	0.0	0.0	106.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Replace air compressors	212.2	0.0	0.0	212.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water System Pumps (804, 805, 806)	530.5	0.0	0.0	0.0	159.1	371.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Replace #2 boiler and the north hot well tank.	371.3	0.0	0.0	106.1	265.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Seven uninterruptible power units for emergency lighting.	84.9	0.0	0.0	0.0	0.0	84.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
First floor L-Wing replace Room 104 obsolete secondary switchgear on Unit Substations 1 and 2.	83.0	61.8	21.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LSB East-Wing replace obsolete secondary switchgear on Unit Substation 4.	41.2	41.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Replace hot water heat exchanger - RF building 4th floor.	20.6		0.0	0.0	20.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Replace hot water heat exchanger - Cafeteria.	30.9		0.0	0.0	0.0	0.0	30.9	0.0	0.0	0.0	0.0	0.0	0.0
Replace Boiler #3.	515.0		0.0	0.0	0.0	0.0	257.5	257.5	0.0	0.0	0.0	0.0	0.0
Replace Sanitary Sewer Lift Station - ESU.	20.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Replace Sanitary Sewer Lift Station – Module 6.	10.3		0.0	0.0	0.0	0.0	0.0	10.3	0.0	0.0	0.0	0.0	0.0
Replace Sanitary Sewer Lift Station – D-Site.	25.8		0.0	0.0	0.0	25.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Infrastructure Equipment replacement.	3941.3	0.0	84.9	0.0	0.0	53.7	267.8	298.7	585.0	602.6	621.1	639.6	788.0
GPE Total (Millions)	**5.99**	**0.12**	**0.11**	**0.42**	**0.44**	**0.54**	**0.56**	**0.57**	**0.59**	**0.60**	**0.62**	**0.64**	**0.79**

Attachment 5 IFI Crosscut Budget

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross Building Area	FY 05 Approp. ($000)	FY 06 Budget Request ($000)	FY 07 Budget ($000)	FY 08 Budget ($000)	FY 09 Budget ($000)	FY 10 Budget ($000)	FY 11 Budget ($000)	FY 12 Budget ($000)	FY 13 Budget ($000)	FY 14 Budget ($000)	FY 15 Budget ($000)	FY 16 Budget ($000)
SITE NAME: Princeton Plasma Physics Laboratory														
PROGRAM														
1.0 Capital Line Item (Include project number & identify Funding Program)														
1.1 New Construction (facilities and additions)														
LSB West Wing Addition	L1	37,000				8,000								
MG, CS and RF Buildings Wall Replacement									6,900					
1.2 All Other Projects (recap)														
Subtotal Line Item Projects		37,000				8,000			6,900					
2.0 General Plant Project (GPP) (Include project number & identify Funding Program)														
2.1 New Construction (facilities and additions)														
2.2 All Other Projects (recap)														
Upgrade CS and COB Roofing Systems	AT G150		305											
CS Hi-Bay Roofing Support System Upgrade	AT G153		80											
Remove & Upgrade CS Building Radiation Shielding Wall	AT G154		396											
Replace RESA Crane Controls	AT G156		243											
Replace C-Site Diesel Generator	AT G157		330											
Upgrade CS Basement Fire Alarm System	AT G158		200											
Upgrade Lab Wing Roofing	AT 1		89	156										
Upgrade CS Building High Bay Crane	AT 2			357										
CS Building Test Cell/High Bay Lighting	AT 3			58										
Upgrade CS Control Room HVAC	AT 4			108										
Seal RF, CS & MG Buildings	AT 5			182										
Upgrade CS Building HVAC	AT 6			250										
Upgrade CS Building Utility Services	AT 7			288										
CS Test Cell Nitrogen Exhaust Ventilation System	AT 8			144										
CS Test Cell Fire Suppression System	AT 9			33										
C-Site MG Building Neutral Beam Rectifier Enclosure HVAC	AT 10			75										
Upgrade Administration/Theory Roofing *	AT 11			159	331									
Upgrade Cafeteria/Administration Wing Roofing	AT 12				250									
Upgrade RESA/CAS Roofing System	AT 13				400									
Relocate HP CASL Operations	AT 14				229									
Narrowband Paging System Conversion	AT 16				230									
BAS Alarm System/Trunk Upgrade	AT 17				150									
Install New Wall Unit Heaters at Lab & Theory Wings	AT 18				220	30								
Computer Center Drainage Improvements	AT 19					30								
Modernize Lab Wing Utility Services	AT 20					230								
Cafeteria Upgrade	AT 21					200								
Consolidation of Waste Management Operations	AT 22					250								
D-Site Fire Alarm Upgrade - Experimental Area	AT 23					460								
C-Site Fire Alarm Upgrade	AT 24					500								
Upgrade VQT1 Transformer	AT 25					350								
Upgrade Substation Breakers	AT 26					250	400	400	400	1,150	250			
L-Wing 1st Floor Electrical Distribution Upgrades	AT 27						115							
L-Wing 2nd Floor Electrical Distribution Upgrades	AT 28						290							
Install New Window Assemblies at Lab Wing, Admin Wing, and Admin Bldg	AT 29						350							
Replace CICADA Computer HVAC Units	AT 30						150							
Replace 2 PPLCC Central Computer HVAC Units	AT 31						140							
LSB Basement UPS for Computer Room & Control Room Stations	AT 32						50							
C & D Site Roadway Improvements	AT 33						200		50					
15KV and 4KV Circuit Breakers	AT 34						400							
Upgrade Emergency Generator Controls	AT 35						50							
Upgrade XQT1 Transformer	AT 36						355	638						
Upgrade C-Site HVAC Systems	AT 37							400	400	600				
Upgrade D-Site HVAC Systems	AT 38							400	400	300				
Replace HVAC Units (CFCs)	AT 39							230						
New Cooling Tower - Phase I	AT 40							445						
Modify Cafeteria Courtyard	AT 41							80						
138kV Switchyard Fire Protection Improvements	AT 42							200						
Grounds Improvement	AT 43							7	93					
NCSX, RF, CS, & MG Building Wall Replacements	AT 44								500	453	2800	3142		
Replace LSB Basement HALON Systems	AT 45								255					
Upgrade Restroom Facilities	AT 46								200					
LSB Penthouse 480V Alternate Power Feed from QPT1 to QPT2	AT 47								100					
Additional Procurement Offices	AT 48								95					
Narrowband Radio System Conversion	AT 49								382	208				
Seismic Retrofit	AT 50									250				
C-Site Modifications													900	900
D-Site Modifications													1,200	1,000
Reserve													1,136	1,433
Subtotal GPP:			1,643	1,810	1,810	2,300	2,500	2,800	2,875	2,961	3,050	3,142	3,236	3,333
3.0 Institutional General Plant Project (IGPP)														
Subtotal IGPP Projects														

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross Building Area	FY 05 Approp. ($000)	FY 06 Budget Request ($000)	FY 07 Budget ($000)	FY 08 Budget ($000)	FY 09 Budget ($000)	FY 10 Budget ($000)	FY 11 Budget ($000)	FY 12 Budget ($000)	FY 13 Budget ($000)	FY 14 Budget ($000)	FY 15 Budget ($000)	FY 16 Budget ($000)
4.0 Operating/Expense for Excess Elimination and Other														
4.1 Excess Elimination (demolition, sale, lease, transfer) Show area eliminated in Gross Area column														
Removal of CASL		55												
4.1 Subtotal		55												
4.2 All Other (List direct O&E maintenance under 5.1)														
4.2 Subtotal														
Subtotal Operating/Expense Projects														
TOTAL Capital & Operating Investment: *			1,643	1,810	1,810	10,300	2,500	2,800	9,775	2,961	3,050	3,142	3,236	3,333
TOTAL Overhead Investments (IGPP)														

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross Building Area	FY 05 Approp ($000)	FY 06 Request ($000)	FY 07 Budget ($000)	FY 08 Budget ($000)	FY 09 Budget ($000)	FY 10 Budget ($000)	FY 11 Budget ($000)	FY 12 Budget ($000)	FY 13 Budget ($000)	FY 14 Budget ($000)	FY 15 Budget ($000)	FY 16 Budget ($000)
SITE NAME: Princeton Plasma Physics Laboratory														
PROGRAM:														
5.0 Maintenance & Repair														
5.1 Direct Funded (by HQ or Site Program)														
Deferred maintenance projects				45	300	540	788	1,035	1,100	1,133	1,167	1,202	1,238	1,275
[The Dry Cooler Cooling Tower for the LSB East Wing Addition will be replaced in FY06. Projects from the GPP list (see section 2.2) will be accomplished in out-years]														
Total Direct Maintenance & Repair				45	300	540	788	1,035	1,100	1,133	1,167	1,202	1,238	1,275
5.2 Indirect (from Overhead or Space Charges)														
Include indirect O/E maintenance projects in total														
Overhead *			4,288	5,171	5,300	5,433	5,568	5,708	5,850	6,026	6,206	6,392	6,584	6,782
Total Indirect Maintenance & Repair			4,288	5,171	5,300	5,433	5,568	5,708	5,850	6,026	6,206	6,392	6,584	6,782
6.0 Indirect O&E Excess Elimination (demolition, sale, lease, transfer) Show area eliminated in Gross Area column														
Total Indirect Excess Elimination		55												

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	FY 05 Square Feet	FY 06 Square Feet	FY 07 Square Feet	FY 08 Square Feet	FY 09 Square Feet	FY 10 Square Feet	FY 11 Square Feet	FY 12 Square Feet	FY 13 Square Feet	FY 14 Square Feet	FY 15 Square Feet	FY 16 Square Feet
SITE NAME												
PROGRAM:												
7.0 Area of Excess Eliminated												
List of projects, by type of funding, with project number, and excess AREA eliminated by fiscal year accomplished.												
Line Item: LSB West Wing Addition					37,000							
Excess Elimination: Removal of CASL	2,170											
GPP												
IGPP												
Operations/Expense												
Indirect Operations/ Expense												
Transfer by sale or lease, or transfer to an outside federal agency												
Subtotal of Excess Facility Area Eliminated	2,170				37,000							
Total Area to be Eliminated Each Year (Demolition, Sale or Transfer Completion Year)												
Total Area to be Added by GPP, IGPP, and LI Construction (List Area Under Occupancy Year)				30,288	37,000							

Attachment 6

Acronyms

ACI	Asset Condition Indices
AUI	Asset Utilization Index
BAS	Building Automation System
BHP	boiler horsepower
BTU	British Thermal Unit
CAMP	Capital Asset Management Process
CASL	Calibration and Service Laboratory
CCWP	Central Chilled Water Plant
CDX-U	Current Drive Experiment-Upgrade
CEA	Classification Exception Area
CY	Calendar Year
D&D	Decontamination and Decommissioning
DESC	Defense Energy Support Center
DM	Deferred Maintenance
DOE	Department of Energy
DOE-SC	Department of Energy off Office of Science
ES&H	Environment, Safety and Health
ES&H/IS	Environment, Safety and Health and Infrastructure Support Department
ESU	Emergency Services Unit
EVES	Emergency Voice Evacuation System
F&I	Facilities and Infrastructure
FCPC	Field Coil Power Conversion
FESAC	Fusion Energy Sciences Advisory Committee
FIMS	Facility Information Management System
FY	Fiscal Year
GPD	gallons per day
GPE	General Purpose Equipment
GPM	gallons per minute
GPP	General Plant Projects
HVAC	heating, ventilating and air conditioning
IFE	Inertial Fusion Energy
IFI	Integrated Facilities and Infrastructure
ISM	Integrated Safety Management
ITER	International Thermonuclear Experimental Reactor
kA	Kilo-amps
KSTAR	Korea Superconducting Tokamak Research Project
kW	Kilo-watts
kWh	Kilowatt-hour
LANL	Los Alamos National Laboratory
LECT	Liquid Effluent Collection Tanks
LLNL	Lawrence Livermore National Laboratory
LPDA	Laboratory Program Development Activities
LSB	Lyman Spitzer Building
LVG	Large Volume firm Gas
M&O	Maintenance & Operations Division

MFE	Magnetic Fusion Experiment
MG	motor-generator
MHD	magneto-hydrodynamic
MNX	Magnetic Nozzle Experiment
MOU	Memorandum of Understanding
MPI	Modernization Planning Indicator
MRX	Magnetic Reconnection Experiment
NASA	National Aeronautics and Space Administration
NBI	Neutral Beam Injection
NCSX	National Compact Stellarator Experiment
NEPA	National Environmental Policy Act
NERSC	National Energy Research Scientific Computing
NJDEP	New Jersey Department of Environmental Protection
NJPDES	New Jersey Pollutant Discharge Elimination System
NSST	Next Step Spherical Torus
NSTX	National Spherical Torus Experiment
OFES	Office of Fusion Energy Sciences (DOE)
ORNL	Oak Ridge National Laboratory
PBX-M	Princeton Beta Experiment-Modification
PEPCO	Potomac Energy Power Company
PPPL	Princeton Plasma Physics Laboratory
PSACI	Plasma Science Advanced Computing Institute
PSE&G	Public Service Electric and Gas
QA	Quasi-axisymmetry
QAS	quasi-axisymmetric stellarator
QO	Quasi-omniginous
QOS	Quasi-omniginous Stellarator
R&D	Research and development
RF	radio frequency
RI	remedial investigation
RIC	Rehab and Improvement Cost
RPAM	Real Property Asset Management
RPV	Replacement Value
SBRSA	Stony Brook Regional Sewage Authority
SC	Office of Science (DOE)
SciDAC	Scientific Discovery through Advanced Computing
SEAB	Secretary of Energy Advisory Board
SLI	Science Laboratory Infrastructure
SPCC	Spill Prevention Control and Countermeasure
sq. ft.	Square Feet
ST	Spherical Torus
TFTR	Tokamak Fusion Test Reactor
TRC	Technical Resources Committee
TSG	Transportation Service Gas
TYSP	Ten-Year Site Plan
UHF	Ultra high frequency
VOCs	volatile organic compounds